

**Common Laboratory Chemicals and Reagent in Secondary Schools -
Their Hazard Natures and Quantities Recommended in the
Standard Furniture and Equipment Lists for Science Subjects**

Chemicals/Reagents	Hazard Nature*	MSDS		Quantity in Standard F/E Lists				
		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	IS
Acetanilide	(H)	101						
Aceto Orcein	(C)	554				10 g		
Agar		188		500 g		500 g		
Albustix, bottle of 50		563						6 bot.
Aluminium, foil		189		250 g				250 g
Aluminium, powder	(F)	189						
Aluminium chloride, anhydrous	(C)	103			100 g			
Aluminium chloride, crystal		102			100 g			
Aluminium nitrate		555						
Aluminium oxide		159		500 g	500 g			
Aluminium sulphate		160		500 g				
1-Aminobutane		280			250 mL			
Aminoethanoic acid		041			100 g			
2-Aminopropanoic acid (L-Alanine)		401						
Ammonia, anhydrous	F T	402	11/91					
Ammonia, solution, 0.880 (35% w/w)	(C)	006		2.5 L	2.5 L			2.5 L
Ammonia, >35% solution	C	006						
Ammonia, 10-35% solution	I	006						
Ammonia, □ 6 M solution	(C)	006						
Ammonia, □ 3 M & < 6 M solution	(I)	006						
Ammonium aluminium sulphate		191			500 g			
Ammonium carbonate		161		500 g				
Ammonium chloride	(H)	162		2 kg	500 g			
Ammonium dichromate	E I	403						
Ammonium iron(II) sulphate		192			500 g			
Ammonium iron(III) sulphate		193			500 g			
Ammonium molybdate(VI)-4- water	(H)	008					100 g	
Ammonium nitrate	(O)	009		250 g				
Ammonium sulphate		163		500 g				
Ammonium thiocyanate	(H)	011						
Ammonium vanadate(V)	(T)	007			100 g			
Amylase		501				10 g		
Amyl acetate (Pentyl ethanoate)	F	272						
Antimony(III) chloride	C	165						
Antimony(V) chloride	C	194						
Arsenic compounds	T	390						
Arsine	T	514						
Ascorbic acid tablets, bottle of 100 tablets		404				1 bottle		

Chemicals/Reagents	Hazard Nature*	MSDS		Quantity in Standard F/E Lists				IS
		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	
Barium chloride	(H)	014		500 g	250 g			
Barium hydroxide	(H)	405						
Barium nitrate	(O) (H)	104			250 g			
Barium peroxide	O H	406						
Barium sulphate		407						
Benedict' s solution		484				500 mL	1 L	
Benzaldehyde	F H	105			200 mL			
Benzene	F T	015	1/91					
Benzene-1,2-diol (Catechol)	(H)	106						
Benzene-1,3-diol (Resorcinol)	H	079						
Benzene-1,4-diol (Quinol)	(H)	408						
Benzene-1,3,5-triol (Phloroglucinol)	(H)	459					25 g	
Benzenecarboxylic acid (Benzoic acid)		016			250 g			
Benzoyl chloride	C	109			100 mL			
Benzoyl peroxide	E I	409						
Benzyl alcohol	H	110						
Benzyl benzoate	H	410						
Benzyl chloride	F I	111						
Beryllium	T	502						
Beryllium compounds (except alumium beryllium silicates)	T	391						
Bicarbonate indicator								
Bile salt (sodium tauroglycocholate)						100 g		
Bismuth(III) chloride	(I)	166			100 g			
Bismuth(III) nitrate	(O) (I)	167						
Biuret reagent	(C) (I)	503						
Bleaching powder	(O) (C)	504		1 kg				
Borax		485						
Boric acid, crystal		017						
Boron trichloride	T	486						
Bromine, 1 mL ampoule	C	019		5 amp	10 amp			
Bromine water	(H)	019						
2-Bromo-2-methylpropane	(F) (H)	114			100 mL			
Bromobenzene	(F) (I)	018			100 mL			
1-Bromobutane	(F) (I)	112			100 mL			
2-Bromobutane	(F)	113			100 mL			
Bromocresol green		195						
Bromophenol blue		411						
Bromothymol blue		196					10 g	
Buffer tablet, pH 7		505			50 tab			
Butan-1-ol	F H	115			1 L			
Butan-2-ol	F H	116			500 mL			

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		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	IS
Butanal	(F)	506			250 mL			
Butane	F	412						
Butanedioic acid (Succinic acid)		117			100 g			
Butanoic acid (butyric acid)	(C)	157			100 mL			
Butanone	F	413	1/95		500 mL			
<i>cis</i> -Butenedioic acid (Maleic acid)	I	414			100 g			
<i>n</i> -Butyl ethanoate	F	279	7/97					
Butylamine	(F) (I)	280						
Calcium, turnings	(F)	171		50 g	100 g			250 g
Calcium carbide	F	507						
Calcium carbonate, marble chips		197		2 kg		500 g		2 kg
Calcium carbonate, precipitated		197		500 g				500 g
Calcium chloride, anhydrous	(I)	198		1 kg	500 g			1 kg
Calcium chloride, crystal	(I)	415						
Calcium ethanedioate		416						
Calcium ethanoate		199			250 g			
Calcium hydroxide	(I)	118		1 kg	500 g	500 g		500 g
Calcium hydroxide, solution (Lime water)		118						
Calcium hypochlorite, solution with active chlorine >39%	O C	417						
Calcium nitrate	(O) (I)	169		500 g				500 g
Calcium oxide	(C)	170			500 g			1 kg
Calcium phosphate monobasic (Calcium tetrahydrogen diphosphate(V))		418						
Calcium sulphate		200		500 g				
Calcium sulphate- 2-water		200						
Canada balsam, dried		508					25 g	
Carbon disulphide	F T	020	1/96					
Casein, powder		487					100 g	100 g
Castor oil		419		250 mL				
Cerium(III) nitrate		509						
Cerium(IV) sulphate	(I)	187						
Charcoal, animal		201						1 kg
Charcoal, block of 70 mm		201		24 pcs				10 pcs
Charcoal, wood powder		201		500 g				500 g
2-Chloro-2-methylpropane		420			500 mL			
Chlorobenzene	F H	119	11/98		100 mL			
1-Chlorobutane	(F)	421			100 mL			
2-Chlorobutane	(F) (H)	510						
Chloroethanoic acid	T	351	11/97		100 g			
Chromium		488						
Chromium(III) chloride	(H)	023			100 g			
Chromium(VI) oxide	O C	203						

Chemicals/Reagents	Hazard Nature*	MSDS		Quantity in Standard F/E Lists				
		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	IS
Chlorine	T	489						
Chlorine water	(C)	556						
Citric acid		172		25 g	100 g	100 g		500 g
Clinistix, bottle of 50	(T)							6 bot.
Cobalt(II) chloride	(H)	422		250 g				
Cobalt(II) nitrate	(H)	204			250 g			
Copper, foil		205		500 g				500 g
Copper, plate		205			500 g			
Copper, powder		205			100 g			
Copper, turnings		205		1 kg				
Copper, wire, 22 s.w.g.		205						250 g
Copper(II) carbonate	(H)	207		500 g				
Copper(II) chloride, solid	(T)	208		250 g				
Copper(II) chloride, □ 1.4M solution	(T)	208						
Copper(II) chloride, □ 0.15 M & < 1.4 M solution	(H)	208						
Copper(II) chromate(VI)	(T)	557						
Copper(II) nitrate-3-water	(H)	511			250 g			250 g
Copper(I) oxide	(H)	206						
Copper(II) oxide	(H)	209		250 g				250 g
Copper pyrites								
Copper(II) sulphate-5-water	(H)	210		2 kg	500 g	500 g		2 kg
Copper(II) sulphate, □ 1 M solution	(H)	210						
Copper(II) sulphide	(H)	512						
Cotton wool, absorbent				2 reels				
Cresol, all isomers	T	559						
Cresol red		423				5 g		5 g
Crude oil	(F) (T)	120		500 mL				500 mL
Cumene (Isopropyl benzene)	F I	424						
Cyclohexane	F	121			250 mL			
Cyclohexanol	H	024	3/98		250 mL			
Cyclohexanone	F H	025	3/97		500 mL			
Cyclohexene	(F) (I)	122			500 mL			
Decanedioyl dichloride	(C)	529						
Decanedioyl dichloride, hexane solution	(F)	529/ 532						
Dettol		530						1 L
Diastase		513						
1,2-Dichlorobenzene	H	425						
1,4-Dichlorobenzene	H	426						
1,2-Dichloroethane	F H	427						
Dichloromethane	H	026						
2,4-Dichlorophenolindophenol (DCPIP)						5 g		

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			CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	
Diethylamine	F	I	123			250 mL			
Dimethylamine	F	I	291						
Dimethylbenzene		(H)	100						
Dinitrobenzene, all isomers		T	560						
2,4-Dinitrophenylhydrazine	(E)	(T)	124			25 g			
Dinitrotoluene, all isomers		T	490						
Diphenylamine		(T)	032			100 g			
Disulphur dichloride		(C)	428			250 mL			
Eosin, alcoholic solution	(F)		564						
Eosin, 16% aqueous solution			430						
Eosin B			429				25 g		
Eosin Y, yellowish			430					25 g	
Eriochrome black T			431						
Ester wax, for section cutting									
Ethanal (acetaldehyde)	F	I	158	11/96		500 mL			
Ethanal, >30% solution		T	158						
Ethanal, 5-30% solution		I	158						
Ethanamide		(H)	393			100 g			
Ethane-1,2-diamine	F	C	036			500 mL			
Ethanedioic acid (Oxalic acid)		H	491	3/96		500 g			
Ethanedioic acid, salts of		H	142						
Ethane-1,2-diol (Ethylene glycol)		H	305	3/99					
Ethanoic acid, glacial	F	C	002	3/92	500 mL	500 mL	500 mL		1 L
Ethanoic acid		C	002						
Ethanol, absolute	F		034			500 mL	500 mL		
Ethanol, 95%	F		034		2 L	1 L	1 L		2.5 L
Ethanol, denatured	F		515						
Ethanoyl chloride	F	C	531						
Ethoxyethane	F		027	7/96		250 mL			
Ethyl benzoate			125			100 mL			
Ethyl ethanoate	F		035			500 mL			2.5 L
Ethyl propanoate	F		432						
Ethylamine, 70% w/w aqueous solution	(F)	(I)	126			250 mL			
Ethylbenzene	F	I	306						
Ethylenediaminetetraethanoic acid disodium salt			127			500 g			
Ethyne	F		433						
Fehling solution No. 1		(H)	492						
Fehling solution No. 2		(C)	493						
Fluorine		T	494						
Fluorescein			434						
D(-)-Fructose			211			25 g			
Gelatin			435						
D(+)-Glucose			516		250 g	500 g	100 g		100 g

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		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	IS
Heptane	(F)	341						
Hexane	(F) (H)	042	7/98		500 mL			
Hexane, mixture of isomers with >5% n-hexane	F H	495						
Hexane, mixture of isomers with <5% n-hexane	F	532						
Hexane-1,6-diamine	(C) (H)	128		25 g				
Hexanedioic acid (Adipic acid)	(I)	436						
Hexanedioyl dichloride (Adipoyl chloride)	(C)	437		25 mL				
Hexan-1-ol	(H)	438						
Hydrazine	F T	497						
Hydrazine, 5-64% solution	C	496						
Hydrochloric acid, conc. (36% w/w) ~11 M	(C)	043		5 L	2.5 L			2.5 L
Hydrochloric acid, >25%	C	043						
Hydrochloric acid, 10-25%	I	043						
Hydrochloric acid, □ 6.5 M	(C)	043						
Hydrochloric acid, □ 2 M & < 6.5 M	(I)	043						
Hydrofluoric acid	T C	044						
Hydrogen	F	439						
Hydrogen chloride, anhydrous	C	440						
Hydrogen cyanide	F T	565						
Hydrogen cyanide, salts of, except complex cyanides <i>eg</i> ferrocyanides, ferricyanides, mercuric oxycyanide	T	084						
Hydrogen fluoride, anhydrous	T C	517	3/95					
Hydrogen peroxide, 20-60% solution	C	045	5/97					
Hydrogen peroxide, 20 volumes (6% w/w)	(I)	045		250 mL	500 mL	250 mL		500 mL
Hydrogen sulphide	F T	441	1/00					
DL-Hydroxypropanoic acid (DL-Lactic acid)	(C)	518						
Indigo carmine		442						
Invertase							50 mL	
Iodine	H	129	9/98	250 g	100 g	100 g		250 g
Iodine, □ 1 M solution	(H)	498						
1-Iodobutane	(F) (H)	443			50 mL			
Iron, coarse filings		212						1 kg
Iron, fine clean filings		212		500 g				1 kg
Iron, wire 30 s.w.g.		499		1 reel				1 reel
Iron(II) chloride-4-water	(H)	500						
Iron(II) sulphate	(H)	213		100 g	250 g			
Iron(II) sulphide	(H)	519		250 g				

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		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	
Iron(II) sulphide, granulated	(H)	519		250 g				
Iron(III) chloride, anhydrous	(I)	038						
Iron(III) chloride-6-water	(I)	376		500 g	250 g			
Iron(III) nitrate	(O) (I)	214		250 g				
Iron(III) oxide, powder		215		500 g				
Iron(III) sulphate	(I)	444			500 g			
Iron pyrites		558						
Isopropyl ethanoate	F	445	3/00					
Isopropyl methanoate	F	377						
Lacmoid, dry		533					5 g	
Lead, foil	(T)	216		500 g	500 g			
Lead, shot, 3mm		378						1 kg
Lead compounds in general	H	534						
Lead(II) bromide	(T)	520		250 g				
Lead(II) carbonate	(T)	217						
Lead(II) chloride	(T)	218			100 g			
Lead(II) ethanoate	(T)	051			500 g			
Lead(II) iodide	(T)	521						
Lead(II) nitrate	(O) (T)	052		1 kg				
Lead(II) oxide	(T)	219		250 g				250 g
Lead(II,IV) oxide (Red lead oxide)	(T)	536			100 g			
Lead(IV) oxide	(T)	173		100 g				
Lead(II) sulphate	(T)	446						
Lead(II) sulphide	(T)	522						
Leishman's stain, for blood smears (in methanol solution)	(F)	537					10g	
Lithium, in liquid paraffin	(F) (C)	221			10 g			
Lithium chloride	(H)	220			50 g			
Litmus, granulated		379			50 g			
Luminol		538						
Lycopodium powder		539						
Lysol	(T)	566						
Magnesium, powder	F	447						
Magnesium, ribbon	(F)	223		2 reels				4 reels
Magnesium carbonate		380			500 g			
Magnesium oxide		448			500 g			
Magnesium sulphate, anhydrous		311		500 g				
Magnesium sulphate-7-water		224			500 g			
Manganese		381						
Manganese(II) chloride		225			250 g			
Manganese(IV) oxide	H	226		500 g				250 g
Manganese(II) sulphate-4-water		540			500 g			
Mercury, redistilled	(T)	348	1/93					
Mercury compounds in general	T	054						

Chemicals/Reagents	Hazard Nature*	MSDS		Quantity in Standard F/E Lists				IS
		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	
Mercury(I) chloride (Calomel)	H (T)	130						
Mercury(II) chloride	(T)	054		100 g				
Mercury(I) nitrate	(T)	175						
Mercury(II) nitrate	(T)	174						
Mercury(II) oxide	(T)	176						
Metaphosphoric acid		382						
Methanal	(T)	131	3/91	250 mL	1 L	500 mL		
Methane	F	449						
Methanoic acid (formic acid)	(C)	039			250 mL			
Methanoic acid, >25%	C	039						
Methanol	F T	057	5/92		500 mL			
Methoxyethane	F	542						
Methoxymethane	F	541						
Methyl cellulose (Polycell), 2-3% solution								
Methyl ethanoate	F	353						
Methyl 2-methylpropenoate	F I	543		250 mL				
Methyl orange		227		25 g	50 g			
Methyl orange, alcoholic solution	(F)	227/034						
Methyl red		228			10 g			
Methyl red, alcoholic solution	(F)	228						
Methyl salicylate (Oil of Wintergreen)	(H)	134						
Methylated spirit	(F) (T)							
Methylene blue, alkaline	(F) (H)	383						100 mL
Methylene blue, alkaline (Loeffler), nuclear stain	(H)	383				10 g		
Methylamine	F I	450						
Methylbenzene (Toluene)	F H	096	7/93	1 L	500 mL			
2-Methylbutane (iso-Pentane)	(F)	133						
2-Methylpropan-1-ol	(H)	451			500 mL			
2-Methylpropan-2-ol	F H	132			500 mL			
Millon' s reagent	(T)	544						
Naphthalen-2-ol (Naphth-2-ol)	(H)	452			100 g			
Nickel, plate		229		500 g	500 g			
Nickel-chromium wire, 20 s.w.g., reel of 125 g								2 reels
Nickel-chromium wire, 32 s.w.g., reel of 125 g								2 reels
Nickel(II) chloride	(H)	060		250 g	250 g			
Nickel(II) sulphate	(H)	231		250 g				
Ninhydrin	(H)	453						
Ninhydrin, aerosol	(H)	453						
Nitric acid, conc.	O C	061	5/96	2.5 L	2.5 L	1 L		2.5 L

Chemicals/Reagents	Hazard Nature*	MSDS		Quantity in Standard F/E Lists				IS
		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	
Nitric acid, >70% (~16M)	O C	061						
Nitric acid, 20-70%	C	061						
Nitric acid, □ 0.5 M	(C)	061						
Nitric acid, □ 0.1 & < 0.5 M	(I)	061						
Nitrobenzene	T	135						
Nutrient agar		545						
Octadecan-1-ol		454						
Octadecanoic acid (stearic acid)		136			250 g			
Octane, all isomers	F	455						
Paraffin oil (Kerosene)	(F)	177		500 mL		1 L		
Paraffin wax		456		1 kg				
Pentan-1-ol (Amyl alcohol)	F	457			500 mL			
Pentan-3-one	F	523						
n-Pentane	(F)	332						
Perchloric acid, >50%	O C	062						
Perchloric acid, 10-50%	C	062						
Pepsin		458					25 g	
Peptone, bacteriological		546					50 g	
Petroleum distillates & coal tar, with flash point < 66°C	F	346						
Petroleum ether, 60-80°C	(F) (H)	346						
Petroleum ether, 100-120°C	(F)	346					500 mL	
Phenol	(C) (T)	063			250 g			
Phenol red, dry		232			5 g			
Phenolphthalein, dry		233		25 g	50 g			
Phenolphthalein, 60% alcoholic solution	(F)	233/034						
Phenyl ammonium chloride	(T)							
Phenylamine (Aniline)	T	012			500 mL			
Phenylamine, salts	T	547						
Phenylethene (Styrene)	F I	336	5/95	250 mL				
Phenylhydrazine	(T)	138						
Phenylsalicylate (Salol)		549						
Phosphoric(V) acid (Orthophosphoric acid)	(C)	065			500 mL			
Phosphoric(V) acid, >25%	C	065						
Phosphoric(V) acid, 10-25%	I	065						
Phosphorus(III) chloride	C	384	9/97		100 mL			
Phosphorus(V) chloride	C	139	1/97		50 g			
Phosphorus(V) oxide	C	140			100 g			
Phosphorus, yellow	F T	548						
Phosphorus, red	F	460						
Phthalic anhydride	(I)	461						

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		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	IS
Polymer kit. Comprising 8 containers of polythene, polystyrene, perspex, PVC, polypropene, nylon, bakelite and urea methanal. Each kind of plastic being contained in plastic vial, 80 g.				1 kit				
Potassium, in liquid paraffin	(F) (C)	524		25 g				
Potassium aluminium sulphate		234						1 kg
Potassium bromate	(O) (T)	178			250 g			
Potassium bromide		068		250 g	250 g			
Potassium carbonate	(I)	235			500 g			
Potassium chlorate	O H	179	1/98					
Potassium chloride		236		250 g	250 g			
Potassium chromate(VI)	I	070		100 g	250 g			500 g
Potassium cyanide	T	069	3/93					
Potassium dichromate(VI)	I	180	9/96	500 g	500 g			
Potassium dihydrogen phosphate		237				250 g		
di-Potassium hydrogen phosphate		033				250 g		
Potassium ethanedioate	(H)	142						
Potassium fluoride	T	385						
Potassium hexacyanoferrate(II)	(T)	182		250 g	100 g			
Potassium hexacyanoferrate(III)	(T)	181		250 g	100 g			
Potassium hydrogencarbonate		238		250 g	250 g			
Potassium hydrogensulphate	(C)	239						
Potassium hydroxide, pellets	C	071		500 g	500 g			
Potassium hydroxide, >5% solution	C	071						
Potassium hydroxide, 1-5% solution	I	071						
Potassium hydroxide, □ 0.5 M solution	(C)	071						
Potassium hydroxide, ≥ 0.05 M & < 0.5 M solution	(I)	071						
Potassium iodate(V)	(O)	072			250 g			
Potassium iodide		073		250 g	1 kg	250 g		500 g
Potassium manganate(VII) (Potassium permanganate)	O H	074	1/99	500 g	250 g			500 g
Potassium nitrate	(O)	184		500 g	250 g			1 kg
Potassium nitrite	O T	392	9/99					
Potassium perchlorate	O H	141						
Potassium persulphate	(O) (H)	143						
Potassium sodium (+)-tartrate		075			250 g			
Potassium sulphate		240		500 g				
Potassium thiocyanate	(H)	076			250 g			
Propan-1,2,3-triol (Glycerol, Glycerine)		309			500 mL	250 mL		250 mL
Propan-1-ol	F	077			500 mL			

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		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	IS
Propan-2-ol	F	078	9/92		500 mL			
Propanal	(F) (I)	144			250 mL			
Propanedioic acid (malonic acid)	(H)	145						
Propanoic acid	(C)	462						
Propanone	F	003	7/91		2.5 L		500 mL	1 L
Pumice stone		242			200 g		200 g	
Pyridine	F H	463						
Pyrogallol (Benzene-1,2,3-triol), resublimed	(H)	464				50 g		
Pyrogallol (Benzene-1,2,3-triol), alkaline solution	(C)	561						
Rocksil				250 g				500 g
Safranine, water and alcohol soluble		465					25 g	
Safranine, 1% alcoholic solution	(F)	465/034						
Salicylic acid	(H)	146			100 g			
Schiff' s reagent	(I)	386						
Schultze' s solution	(C)						100 mL	
Silica		550						
Silica gel		466						
Silicon		525			100 g			
Silicon(IV) oxide		466			500 g			
Silicon tetrachloride	(I)	147			100 g			
Silver nitrate	C	081	5/99	50 g	100 g			
Silver nitrate, ≥0.5M solution	(C)	081						
Silver nitrate, ≥0.2M <0.5M solution	(I)	081						
Silver oxide	(O) (I)	244		25 g				
Soda lime	(C)	148		500 g		250 g		500 g
Sodium, in liquid paraffin	(F) (C)	149		25 g				
Sodium benzoate		467			500 g			
Sodium bromide		468		250 g				
Sodium carbonate, anhydrous	(I)	245		1 kg	1 kg			1 kg
Sodium chlorate	O H	469						
Sodium chloride, fine		246		2 kg		250 g		2 kg
Sodium citrate		247		100 g		100 g		
Sodium cyanide	T	084	3/93					
Sodium dichromate	I	365						
Sodium ethanedioate	(H)	150			250 g			
Sodium ethanoate, anhydrous		470			500 g		500 g	
Sodium fluoride	(T)	151						
Sodium hydrogencarbonate		249		1 kg	500 g	500 g		500 g
diSodium hydrogenphosphate		471						
Sodium hydrogensulphate	(C)	250						
Sodium hydrogensulphite	H	472			500 g			

Chemicals/Reagents	Hazard Nature*	MSDS		Quantity in Standard F/E Lists				
		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	IS
Sodium hydroxide, pellets	C	085		1 kg	1.5 kg	500 g		1 kg
Sodium hydroxide, >5% solution	C	085						
Sodium hydroxide, 1-5% solution	I	085						
Sodium hydroxide, ≥ 0.5 M solution	(C)	085						
Sodium hydroxide, ≥ 0.05 M & < 0.5 M solution	(I)	085						
Sodium hypochlorite, solution with >10% active chlorine	C	371	9/94					
Sodium hypochlorite, solution with 5-10% active chlorine	I	551						
Sodium iodide		473		250 g				
Sodium nitrate	(O) (I)	185		250 g				
Sodium nitrite	O T	152			250 g			
Sodium nitroprusside	(T)	252						
Sodium oxalate		150						
Sodium perchlorate	O H	387						
Sodium peroxide	O C	474			100 g			
Sodium persulphate	(O) (I)	475						
Sodium silicate	(I)	254						
Sodium sulphate		087		500 g				
Sodium sulphate, anhydrous		087			500 g			
Sodium sulphide	C	153						
Sodium sulphite		476		250 g	250 g			
Sodium thiosulphate		186		500 g	1 kg		500 g	
Solder				500 g				
Sorbic acid								250 g
Starch		256		250 g	250 g	500 g	100 g	500 g
Strontium chloride		257			100 g			
Strontium nitrate	(O) (H)	258			100 g			
Succinic anhydride	I	477						
Sucrose		478		250 g		500 g		
Sudan III, dry		479					20 g	
Sudan III, alcoholic solution	(H) (F)	479/034						
Sulphur, crushed	(F)	154		1 kg				1 kg
Sulphuric acid, conc. (97% w/w) (~18 M)	C	090	11/94	5 L	2.5 L			2.5 L
Sulphuric acid, >15%	C	090						
Sulphuric acid, 5-15%	I	090						
Sulphuric acid, □ 0.5 & < 1.5 M solution	(C)	090						
Sulphuric acid, □ 1.5 M solution	(I)	090						
Test paper, blue litmus		379		3 packs	1 pk			10 bks
Test paper, cobalt chloride		422			1 pk	10 bks		10 bks
Test paper, lead ethanoate		535			1 pk			
Test paper, neutral litmus		379		3 pks	4 pks			

Chemicals/Reagents	Hazard Nature*	MSDS		Quantity in Standard F/E Lists				
		CityU MSDS No.	Green Cross ⁺	Chem (S4-5)	Chem (AL)	Bio (S4-5)	Bio (AL)	IS
Test paper, pH, range 1-14		262		12 pks	4 pks	10 bks		4 rolls
Test paper, red litmus		379		3 pks	1 pk			10 bks
Test paper, starch iodide		073			1 pk			
Tetrachloroethene	H	480						
Tetrachloromethane	T	021	5/91					
Thionyl chloride	C	337						
Thiourea (Thiocarbamide)	(H)	094						
Thymol blue, dry		481				5 g		5 g
Thymol blue, alcoholic solution	(F)	562						
Tin, foil		526		100 g	250 g			250 g
Tin(II) chloride	(H)	095			100 g			
Tin(IV) chloride	C	260			100 g			
1,1,1-Trichloroethane	H	155	7/92					
Trichloromethane	H	022				250 mL		
Triethylamine	F I	482						
Trimethylamine	F I	483			250 mL			
Trypsin		527						
Tumeric paper								
Turpentine	F H	156	11/95					
Universal indicator, alcoholic solution	(F)	262		100 mL	100 mL			250 mL
Urea		099		250 g	500 g		500 g	
Urease		528					25 g	
Vanadium(V) oxide	H	388	5/98					
Vaseline		552		100 g		500 g		100 g
Volasil 244	F			500 mL	500 mL			
Xylene (dimethylbenzene)	F H	100					500 mL	
Xylene, all isomers	F H	100	11/99					
Yeast, dry		553						
Zinc, foil		265		250 g				250 g
Zinc, granulated		266		1 kg				500 g
Zinc, plate		265			500 g			
Zinc, powder (dust)	F	265			500 g			
Zinc carbonate		263		250 g				
Zinc chloride	C	264		250 g				
Zinc nitrate	(O) (H)	267		100 g				
Zinc oxide		389						
Zinc sulphate	(I)	190		250 g	500 g			

* Key to the codes representing hazard natures:

E = Explosive

F = Flammable

O = Oxidising

T = Toxic

H = Harmful

C = Corrosive

I = Irritant

Classification is made with reference to the "Factories and Industrial Undertakings (Dangerous Substances) Regulations (Cap. 59 Section 7)" (*The regulations apply to industrial undertakings and processes*).

Codes in brackets represent recommendations from UK and European regulations.

- + Green Cross (綠十字) is a bimonthly magazine published by the Occupational Safety and Health Council (OSHC). Usually one Material Safety Data Sheet (MSDS) in Chinese is provided on every issue and MSDSs for about 60 chemicals have been released so far. The magazine is available in the OSHC Library located at 19/F, China United Centre, 28 Marble Road, North Point, Hong Kong (Tel. 2739 9779) or through free subscription.

Science Section
Education Department
December 2000

Material Safety Data Sheet

City University of Hong Kong

MSDS**ACETIC ACID GLACIAL****0002****PRODUCT INFORMATION**

Chemical Name: Acetic Acid Glacial

Chinese Name: 醋酸

Synonyms: Ethanoic Acid, Ethylic Acid, Methane Carboxylic Acid, Vinegar Acid

Chemical Family: Organic Acid

Molecular Formula: CH_3COOH

C.A.S. : 64-19-7

Product Use: -

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

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Appearance And Odour: Colourless with sharp vinegar odour

Boiling Point: 118 deg. C

Vapour Density (Air=1): 2.1

Specific Gravity: 1.05

pH: Not Applicable

Solubility In Water: Complete

FIRE AND EXPLOSION DATA

Condition Of Flammability; Flammable

Flash Point: 43 deg. C

Flammable Limits: Lower 4% Upper 20%

Special Fire Fighting Procedures

Fire-fighter should wear a self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Use water spray to cool nearby containers and structures exposed to fire.

REACTIVITY DATA

Stability: Stable

Incompatibility:

Alkalis, oxidizing or reducing materials, cyanides, sulfides, combustible materials, chromic acid, nitric acid, hydrogen peroxide, active metals, amines, oxides and carbonates.

Hazardous Decomposition Products: May liberate carbon monoxide and carbon dioxide.

HEALTH HAZARD DATA

ROUTE OF ENTRY:

Eye :

Vapours, liquid, and mists are extremely corrosive to the eyes. Brief contact of the vapours will be severely irritating. Brief contact of the liquid or mists will severely damage the eyes and prolonged contact may cause permanent eye injury which may be followed by blindness.

Skin :

Vapours, mists, and liquid are extremely corrosive to the skin. Vapours will severely irritate the skin and liquid and mists will severely burn the skin. Prolonged liquid contact will burn or destroy surrounding tissues and death may accompany burns which extend over large portions of the body.

Ingestion : Vapours, mists, and liquid are extremely corrosive to the mouth and throat.

Swallowing :

The liquid burns the tissues, causes severe abdominal pain, nausea, vomiting, and collapse. Swallowing large quantity can cause death.

Inhalation :

Vapours and mists are extremely corrosive to nose, throat, and mucous membranes. Bronchitis, pulmonary oedema, and chemical pneumonitis may occur. Irritation, coughing, chest pain, and difficulty in breathing may occur with brief exposure while prolonged exposure may result in more severe irritation and tissue damage. Breathing high concentration may result in death.

Toxicological Properties:

Acgih Threshold Limit Value (TLV): 10 ppm

Osha Permissible Exposure Limit (PEL): 10 ppm

Oral: Rat LD₅₀ = 3310 mg/kg

Dermal: Rabbit LD₅₀ = 1060 mg/kg

Inhalation: (Irritant); Mouse LC₅₀ = 5620 ppm/ 1 Hr.

FIRST AID MEASURES

Eye : Immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

Skin :

Immediately flush skin with plenty of water. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

Ingestion : Give large amount of water if person is conscious. Call a physician.

Inhalation :

If overexposed, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen and call a physician.

PREVENTATIVE MEASURES

Ventilation:

Ventilation capable of maintaining emissions at the point of use below the pel. Local exhaust recommended

Respiratory Protection:

Wear a niosh-approved respirator appropriate for the vapour or mist concentration at the point of use. Appropriate respirators may be a full facepiece air-purifying cartridge respirator equipped for organic vapours/acid gas, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye protection: Safety glasses with side shields are recommended.

Skin Protection: Impervious gloves should be worn, wash thoroughly after handling.

Storage Requirements:

Store in a cool, dry, well ventilated area away from incompatible materials. Keep container tightly closed. Store in accordance with federal, provincial and municipal regulation. Do not store or consume food, drinks, or tobacco in area where they may become contaminated with this material. Do not store below 12 deg. C (55 deg. F).

ENVIRONMENTAL PROTECTION DATA

Spills:

Review fire and explosion hazard and safety precaution before proceeding with the clean up, use appropriate personal protective equipment during clean up. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent material and carefully neutralize with soda ash or lime. If soda ash is used, provide adequate ventilation to dissipate carbon dioxide gas.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ACETONE****0003****PRODUCT INFORMATION**

Chemical Name: Acetone

Chinese Name: 丙酮

Synonyms: Dimethylketone, 2-Propanone, Pyroacetic Ether

Chemical Family : Ketone

Molecular Formular: CH_3COCH_3

Cas No. 67641

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Appearance And Odour: Clear, colourless liquid

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Boiling Point : 134 deg. F
Specific Gravity: 0.791 (H₂O=1)
pH Of Undiluted Product: N.A.
Vapour Pressure: 157@20 mmHg
Viscosity: N.D.
Percent Voc: 100
Vapour Density: 2.0
Solubility In Water: Sol.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Flash Point (Method): -4 deg. F
Flammable Limits (%) Lower: 2.6. Upper: 12.8
Ignition Temp. : N.D.
Recommended Fire Extinguishing Agents And Special Procedures:
According to nfpa guide, use dry chemical, foam, or carbon dioxide. water may be ineffective on flames, but should be used to cool fire-exposed containers. If a leak or spill has not ignited, use water spray to disperse the vapours and to provide protection for personnel attempting to stop the leak.

Unusual Or Explosive Hazards:
Danger extremely flammable materials may release vapours that travel a considerable distance to a source ignition and flash back. Containers may explode in a fire. Do not expose to heat, sparks, flame, static, or other sources of ignition. When handling, use non-sparking tool, ground and bond all containers. Explosive air-vapour mixtures may form.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerizations: Will not occur
Incompatibility: Acid, strong oxidizers
Products Evolved When Subjected To Heat Or Combustion:
Toxic levels of carbon monoxide, carbon dioxide, irritating aldehydes and ketones.

HEALTH HAZARD DATA

Effects Of Overexposure:
Acute:
Eyes:
May cause irritation, experienced as discomfort, and seen as excess redness and swelling of the eye.

Skin:

No adverse effects expected from absorption of material through the skin. Brief contact may cause slight irritation. Prolonged contact, as with clothing wetted with material, may cause more severe irritation and discomfort, seen as local redness and swelling.

Inhalation:

Vapours or mist may cause irritation of the nose and throat, headache, nausea, vomiting, dizziness, drowsiness, euphoria, loss of coordination, and disorientation. In poorly ventilated areas or confined spaces, unconsciousness and asphyxiation may result.

Ingestion:

If more than several mouthfuls are swallowed, abdominal discomfort, nausea, and diarrhea may occur. Aspiration may occur during swallowing or vomiting resulting in lung damage.

Sensitization properties: unknown.

Chronic: Repeated skin contact may cause a persistent irritation or dermatitis.

Medical Conditions Aggravated By Exposure:

Because of its irritating properties, repeated skin contact may aggravate an existing dermatitis (skin condition).

Other Remarks: None

Toxicological Information(Animal Toxicity Data)

Median Lethal Dose (LD₅₀ LC₅₀) (Species)

Oral: 8.5-10.7 g/kg (Rat); Practically non-toxic

Inhalation: N.D.

Dermal: 20 g/kg (Rabbit); Practically non-toxic

Irritation Index, Estimation Of Irritation (Species)

Skin: Believed To Be 0.5-3.0/8.0 (Rabbit); Slightly irritating

Eyes: Believed To Be 25-50/110 (Rabbit); Moderately irritating

Sensitization: N.D.

Other: None

Ventilation: Adequate to meet occupational exposure limits. (see below)

Exposure Limit For Total Product:

750 ppm (1,780 mg/m³) TWA (ACGIH)

750 ppm TWA (OSHA)

1000 ppm STEL (OSHA/ACGIH)

FIRST AID MEASURES

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Get medical attention.

Skin:

Wash skin with plenty of soap and water for several minutes. Get medical attention if skin irritation develops or persists.

Ingestion:

If swallowed, get immediate medical attention. Only induce vomiting as directed by a doctor. Never give anything by mouth to an unconscious or convulsing person.

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may administer oxygen. Get immediate medical attention.

Other Instructions:

Note to physician: aspiration of this product during induced emesis can result in lung injury. If evacuation of stomach contents is considered necessary, use method least likely to cause aspiration, such as gastric lavage after endotracheal intubation.

PREVENTATIVE MEASURES

Protective Equipment (Type)

Eye/Face Protection:

Avoid eye contact. Chemical type goggles should be worn. Do not wear contact lenses.

Skin Protection:

Workers should wash exposed skin several times daily with soap and water. soiled work clothing should be laundered or dry-cleaned at least once a week.

Respiratory Protection:

Airborne concentrations should be kept to lowest levels possible. If vapour, mist or dust is generated, use respirator approved by MSHA or NIOSH as appropriate. Supplied air respiratory protection should be used for cleaning large spills or upon entry into tanks, vessels, or other confined spaces. See below for applicable permissible concentrations.

Precautions To Be Taken In Handling And Storage:

Use spark-proof tools. Keep away from heat, sparks, flame and other sources of ignition. Material may be at elevated temperatures and/or pressures. Exercise due care when opening bleeders and sampling ports.

ENVIRONMENTAL PROTECTION DATA

Procedures In Case Of Accidental Release, Breakage Or Leakage:

Eliminate all ignition sources including internal combustion engines and power tools. Ventilate area. Keep people away. Stay upwind and warn of possible downwind explosion hazard. Avoid breathing vapour. Wear self-contained breathing apparatus. Avoid contact with skin, eyes or clothing. Use self-contained breathing apparatus or supplied air mask for large spills or confined areas. Contain spill if possible. Remove with inert absorbent. Prevent entry into sewers and waterways.

Material Safety Data Sheet

City University of Hong Kong

MSDS**AMMONIA SOLUTION****0006****PRODUCT INFORMATION**

Chemical Name: Ammonia Solution

Chinese Name: 氨水

Synonyms: Aqua Ammonia, Ammonium Hydroxide

Chemical Family: Alkali

Formula: NH_4OH

CAS No.: 1336-21-6

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Boiling Point : 82-105 deg. F

Vapour Pressure, mmHg/20 deg. C: 560

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Melting Point : -97 deg. F
Specific Gravity (Water=1): 0.90-0.913
Appearance And Odour: Clear, water-white liquid, strong pungent ammonia odour
Evaporation Rate (Butyl Acetate=1): >1
Vapour Density (Air=1): 0.60
Water Solubility, %: 100

FIRE AND EXPLOSION DATA

Condition Of Flammability: Nonflammable

Flash Point : None

Flammable Limits Lower: 16 Upper: 25

Extinguishing Media: Use water spray, dry chemical or CO₂.

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Flammable ammonia gas will be liberated at all temperatures which can be explosive under some conditions. The addition of this product to concentrated mineral acids will cause instant boiling and a possible explosion.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibilities:

Acids, oxidizing materials, copper, aluminum, zinc, galvanized metals, gold, silver, and alloys of these metals.

Hazardous Decomposition Products: Ammonia gas and oxides of nitrogen.

Conditions To Avoid: Heat, sparks, and open flames.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, skin or eye contact.

Signs And Symptoms Of Exposure:

Inhalation:

Vapours and mists are extremely corrosive to the nose, throat, and mucous membranes. Bronchitis, pulmonary edema, and chemical pneumonitis may occur. Irritation, coughing, chest pain, and difficulty in breathing may occur with brief exposure while prolonged exposure may result in more severe irritation and tissue damage. Breathing high concentrations may result in death.

Eye Contact:

Vapours, liquid, and mists are extremely corrosive to the eyes. Brief contact of the vapours will be severely irritating. Brief contact of the liquid or mists will severely damage the eyes and pro-prolonged contact may cause permanent eye injury which may be followed by blindness.

Skin Contact:

Vapours, mists, and liquid are extremely corrosive to the skin. Vapours will severely irritate the skin and liquid and mists will severely burn the skin. Prolonged liquid contact will burn or destroy surrounding tissue and death may accompany burns which extend over large portions of the body.

Swallowed:

Vapours, mists, and liquid are extremely corrosive to the mouth and throat. Swallowing the liquid burns the tissues, causes severe abdominal pain, nausea, vomiting, and collapse. Swallowing as little as a teaspoonful of this product can cause death.

Chronic Effects Of Exposure: No specific information available.

Medical Conditions Generally Aggravated By Exposure:

Persons with pre-existing eye or pulmonary disease may be susceptible to aggravation from exposure.

Oral: Human LDLO=43 mg/kg; Rat LD₅₀=350 mg/kg

Dermal: No data available

Inhalation: Human LDLO=1000 ppm/3hr; mouse LC₅₀=4837 ppm/1hr; Human LCLO=5000 ppm

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

Other Data:

Human inhalation TCLO=408 ppm. odour is perceptible at 5 ppm, causes discomfort at 150-200 ppm, is severely irritating at 400-700 ppm, may be fatal within 30 min at 2000-3000 ppm, and is immediately fatal at 10,000 ppm.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 30 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 30 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the pel.

Respiratory Protection:

If use conditions generate vapours or mists, wear a niosh-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece respirator equipped with ammonia cartridges, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles and full faceshield unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing:

Alkali-resistant slicker suit with rubber apron, rubber boots with pants outside, and rubber gloves with gauntlets.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Vent container frequently, and more often in warm weather, to relieve pressure. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions:

Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear alkali-resistant slicker suit and complete protective equipment including rubber gloves, rubber boots, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full face piece air-purifying cartridge respirator equipped with ammonia filters may be satisfactory. In any event, always wear eye protection. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent material and carefully neutralize with dilute hydrochloric acid. Keep non-neutralized material out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS AMMONIUM META-VANADATE 0007**PRODUCT INFORMATION**

Product Name: Ammonium Meta-Vanadate

Chinese Name: 偏钒酸铵

Common Synonyms: Ammonium Vanadate(V); Vanadic Acid, Ammonium Salt

Chemical Family: Vanadium Compounds

Formula: NH_4VO_3

Formula Wt.: 116.98

Cas No.: 7803-55-6

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Toxicity Of Components:

Oral Rat LD₅₀ For Ammonium Meta-Vanadate 160 mg/kg

Intraperitoneal Rat LD₅₀ For Ammonium Meta-Vanadate 18 mg/kg

Subcutaneous Rat LD₅₀ For Ammonium Meta-Vanadate 23 mg/kg

Carcinogenicity: NTP: No IARC: No Z List: No OSHA Reg: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation: Irritation of upper respiratory tract

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. Induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in secure poison area.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

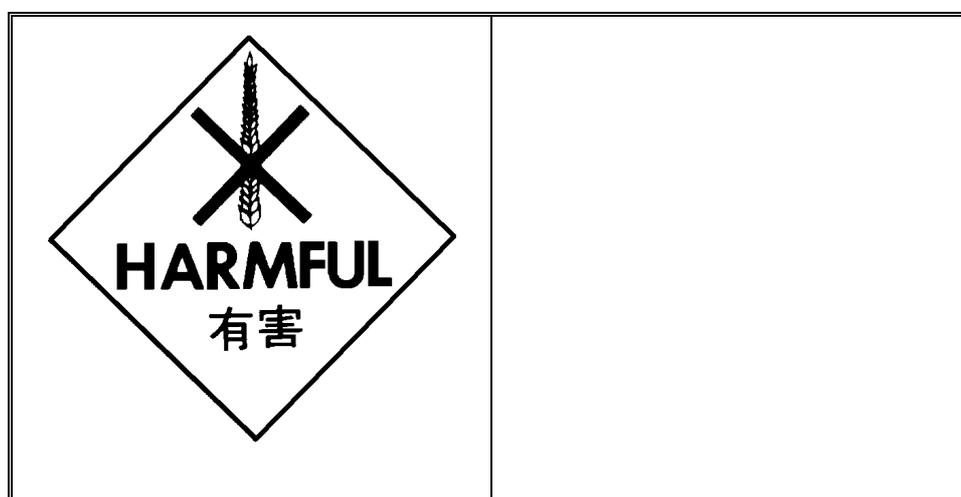
Wear self-contained breathing apparatus and full protective clothing. with clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS AMMONIUM MOLYBDATE, 4-HYDRATE 0008**PRODUCT INFORMATION**

Product Name: Ammonium Molybdate, 4-Hydrate
Chinese Name: 鉬(VI)酸銨
Common Synonyms: Ammonium Heptamolybdate, Tetrahydrate
Chemical Family: Molybdenum Compounds
Formula: $(\text{NH}_4)_6\text{MO}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$
Formula Wt.: 1235.86
CAS No.: 12054-85-2
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Permissible Exposure Limit (PEL): 5 mg/m³

Pel Is For Molybdenum, Soluble Compounds, As Mo.

Toxicity Of Components:

Oral Rat LD₅₀ For Ammonium Molybdate, 4-Hydrate

333 mg/kg

Carcinogenicity: NTP: No IARC: No Z List: No OSHA Reg: No

Carcinogenicity: None Identified.

Reproductive Effects: None Identified.

Effects Of Overexposure:

Inhalation: Irritation of upper respiratory tract

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: May be harmful

Chronic Effects: None identified

Target Organs: Respiratory System, Lungs, In Animals: Kidneys, blood

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a high-efficiency particulate respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. with clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**AMMONIUM NITRATE****0009****PRODUCT INFORMATION**

Product Name: Ammonium Nitrate

Chinese Name: 硝(V)酸銨

Common Synonyms: Ammonium (I) Nitrate; Nitric Acid, Ammonium Salt

Chemical Family: Ammonium Salts

Formula: NH_4NO_3

Formula Wt.: 80.04

CAS NO.: 6484-52-2

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: 210 deg. C (410 deg. F) Decomposes Vapour Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 170 deg. C (338 deg. F) Vapour Density (Air=1): 2.8
(@ 760 mmHg)
Specific Gravity: 1.73 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: 5.4 (0.1M Solution)
Odour Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odour: White granules. Odourless.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Nonflammable
Fire Extinguishing Media: Use water spray.
Flash Point (Closed Cup): N/A
Flammable Limits: Upper - N/A Lower - N/A
Autoignition Temperature: N/A
Toxic Gases Produced: Ammonia, oxides of nitrogen
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Note: decomposes at boiling point. Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibles:
Strong reducing agents, combustible materials, strong acids, organic materials, chemically active metals, powdered metals

Decomposition Products: Ammonia, oxides of nitrogen
Conditions To Avoid: Heat, shock, flame

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Ammonium Nitrate 4820 mg/kg

Oral Rat LD₅₀ For Ammonium Nitrate 4820 mg/kg

Oral Rat LD₅₀ For Ammonium Nitrate 4820 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None Identified.

Effects Of Overexposure:

Inhalation: tightness and pain in chest, coughing, difficult breathing

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Headache, nausea, vomiting, gastrointestinal irritation, convulsions, unconsciousness

Chronic Effects: None identified

Target Organs: Eyes, Skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**AMMONIUM THIOCYANATE****0011****PRODUCT INFORMATION**

Product Name: Ammonium Thiocyanate

Chinese Name: 硫化氰酸銨

Common Synonyms: Thiocyanic Acid, Ammonium Salt; Ammonium Sulfocyanate

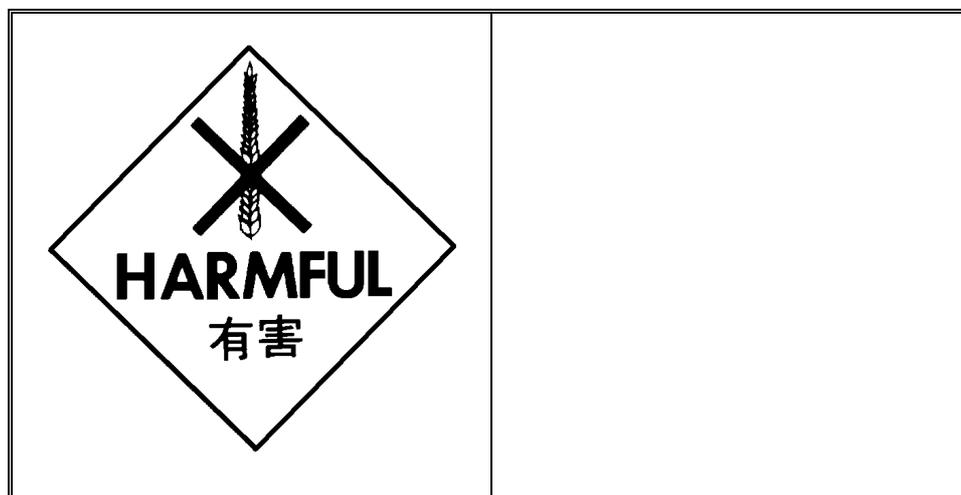
Chemical Family: Sulfur Compounds

Formula: NH_4SCN

Formula Wt.: 76.12

CAS No.: 1762-95-4

Product Use: Laboratory reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: 170 deg. C (338 deg. F) Vapour Pressure (mmHg): N/A
(@ 760 Mm Hg)
Melting Point: 149 deg. C (300 deg. F) Vapour Density (Air=1): N/A
(@ 760 Mm Hg)
Specific Gravity: 1.30 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odour Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odour: White crystals. Odourless.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Nonflammable
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Flash Point (Closed Cup): N/A
Flammable Limits: Upper - N/A Lower - N/A
Autoignition Temperature: N/A
Toxic Gases Produced: Ammonia, hydrogen cyanide, oxides of nitrogen, sulfur dioxide
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: Contact with strong oxidizers may cause fire or explosion.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibles: Strong acids, strong oxidizing agents
Decomposition Products: Ammonia, hydrogen cyanide, oxides of nitrogen, oxides of sulfur
Conditions To Avoid: Heat

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No
Carcinogenicity: None identified.
Reproductive Effects: None identified.
Effects Of Overexposure:
Inhalation: Irritation of nose and throat, irritation of upper respiratory tract
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: May be harmful
Ingestion: Headache, nausea, vomiting, dizziness, gastrointestinal irritation
Chronic Effects: Central nervous system depression

Target Organs: Central nervous system
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, ingestion, absorption, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. Induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact: In case of contact, flush skin with water.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.
Respiratory Protection:
None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.
Eye/Skin Protection: Safety goggles, neoprene gloves are recommended.
Storage Requirements:
Keep container tightly closed. Suitable for any general chemical storage area. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. with clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**ANILINE****0012****PRODUCT INFORMATION**

Product Name: Aniline

Chinese Name: 苯胺

Common Synonyms: Benzamine; Aniline Oil, Phenylamine; Aminobenzene; Benzenamine

Chemical Family: Amines

Formula: $C_6H_5NH_2$

Formula Wt.: 93.13

CAS NO.: 62-53-3

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Liquid
Boiling Point: 184 deg. C (363 deg. F) Vapour Pressure (mmHg): 0.6
(@ 760 mmHg) (20 deg. C)
Melting Point: -6 deg. C (21 deg. F) Vapour Density (Air=1): 3.22
(@ 760 mmHg)
Specific Gravity: 1.02 Evaporation Rate: <1
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): 3.6% % Volatiles By Volume: 100
(21 deg. C)
pH: 8.1 (0.2M Solution)
Odour Threshold (ppm): 1.0
Coefficient Water/Oil Distribution: N/A
Appearance & Odour: Colourless viscous liquid. Sweet odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Fire Extinguishing Media: Use water spray, carbon dioxide, dry chemical or ordinary foam.
Flash Point (Closed Cup): 69 deg. C (158 deg. F)
Flammable Limits: Upper - 11.0 % Lower - 1.3 %
Autoignition Temperature: 614 deg. C (1139 deg. F)
Toxic gases produced: ammonia, oxides of nitrogen, carbon monoxide, carbon dioxide
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards:
Vapours may flow along surfaces to distant ignition sources and flash back. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibles:
Strong oxidizing agents, strong bases, strong acids, alkalis, zinc, aluminum, leather, solutions containing iron salts
Decomposition Products: Oxides of nitrogen, ammonia, carbon monoxide, carbon dioxide
Conditions To Avoid: Heat, flame, other sources of ignition, air, light

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 7.6 mg/m³ (2 ppm)

The TLV Listed Denotes TLV (Skin).

Short-Term Exposure Limit (STEL): Not Established

Permissible Exposure Limit (PEL): 8 mg/m³ (2 ppm)

The PEL Listed Denotes PEL (Skin).

Toxicity Of Components:

Oral Rat LD₅₀ For Aniline

250 mg/kg

Skin Rat LD₅₀ For Aniline

1400 mg/kg

Intraperitoneal Rat LD₅₀ For Aniline

420 mg/kg

Inhalation-7hr Mouse LC₅₀ For Aniline

175 ppm

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: Tests on laboratory animals indicate material may be carcinogenic.

Reproductive Effects: Tests on laboratory animals indicate material may be mutagenic.

Effects Of Overexposure:

Inhalation:

May be fatal, causes methemoglobin formation in the blood, cyanosis, unconsciousness, headache, nausea, vomiting, dizziness, confusion, drowsiness

Skin Contact: Irritation

Eye Contact: Severe irritation, permanent eye damage

Skin Absorption:

May be fatal, causes methemoglobin formation in the blood, cyanosis, unconsciousness, headache, nausea, vomiting, dizziness, confusion, drowsiness

Ingestion:

May be fatal, causes methemoglobin formation in the blood, cyanosis, unconsciousness, headache, nausea, vomiting, dizziness, confusion, drowsiness

Chronic Effects: Anemia, And Skin Lesions, Kidney Damage, Liver Damage

Target Organs: Blood, cardiovascular system, liver, kidneys, central nervous system

Medical Conditions Generally Aggravated By Exposure:

Central nervous system disorders, cardiovascular disorders, liver disorders, bone marrow disease, kidney disorders

Primary Routes Of Entry: Inhalation, absorption, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. Induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Thorough cleansing of the entire contaminated area of the body including scalp and nails is of the utmost importance.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

Notes To Physician:

Absorption of this product into the body leads to the formation of methemoglobin. If signs of excessive methemoglobinemia develop (cyanosis, vomiting, shock, coma) - give 100% oxygen by mask and 1% methylene blue solution intravenously (1 to 2 mg/kg of body weight over 5 to 10 minutes). This may be repeated in 1 hour if necessary. Thorough cleansing of the entire contaminated area of the body is of utmost importance. Reversion of methemoglobin to hemoglobin occurs spontaneously. Moderate degrees of cyanosis need be treated only by supportive measures such as bed rest and oxygen. Cyanocobalamin (B12), 1 mg intramuscularly, may speed recovery. Intravenous fluids and blood transfusions may be indicated in very severe circumstances.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. at concentrations up to 100 ppm, a chemical cartridge respirator with organic vapour cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area or cabinet. Keep product out of light.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapours. take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BARIUM CHLORIDE****0014****PRODUCT INFORMATION**

Chemical Name: Barium Chloride Dihydrate

Chinese Name: 氯化鋇

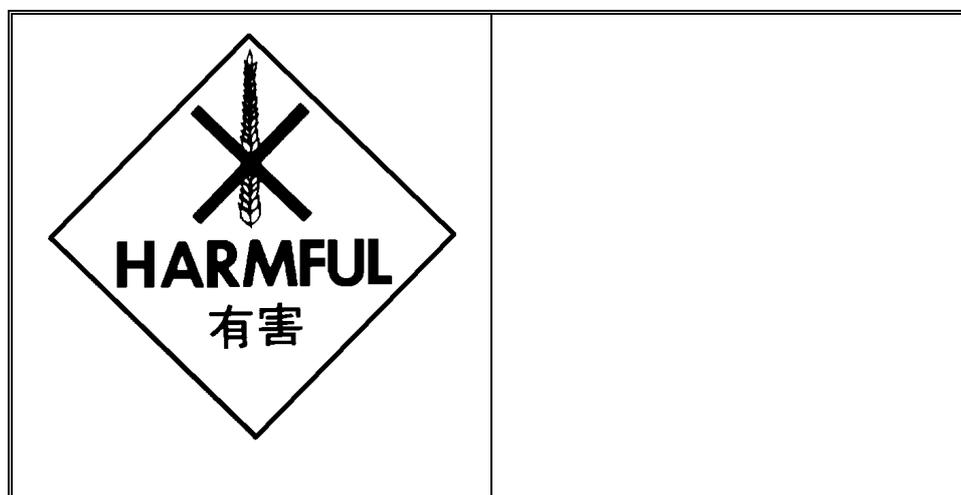
Chemical Family: Chlorates

Molecular Formula: $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$

C.A.S. : 10361-37-2

Product Use:

In manufacture of barium salts, insecticide, rat poison, pigments, boiler detergent, etc; in tanning and finishing leather; in purifying sugar; as mordant in dyeing and printing textiles, as water softener.

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CPHK for their inaccuracies.

Physical State: Solid
Odour And Appearance: Colourless, odourless crystals
Odour Threshold: Not applicable
Vapour Pressure: Not applicable
Evaporation Rate: Not applicable
Boiling Point: Not available
Solubility In Water: 31 g/100 ml @ 0 deg. C
Specific Gravity: (H₂O = 1) 3.856
% Volatile By Volume: Not available
Bulk Density: Not available
Coefficient Of Water/Oil Distribution: Not available

Vapour Density: Not applicable
pH: 5% Solution - 5.2 TO 8.2
Melting Point: 963 deg. C
Molecular Weight: 244.28

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Non-Flammable
Means Of Extinguishing: Dry chemical, sand
Flash Point: Not applicable
Explosion Hazards: None
Upper Flammable Limit: Not applicable
Lower Flammable Limit: Not applicable
Auto Ignition Temperature: Not applicable
Hazardous Combustion Products: Not applicable
Special Fire Fighting Procedures: None

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibility: Strong acids
Hazardous Reactions/Decompositions:
Contact with strong acid will liberate dangerous gases (I.E. HCl, Cl₂, NO₂)

Conditions To Avoid: Reacts violently with bromine trifluoride, 2-furan percarboxylic acid.

HEALTH HAZARD DATA

Inhalation: Toxic - TLV 0.5 mg/m³ As Ba
Skin Contact: Irritant
Eye Contact: Irritant
Ingestion: Toxic by ingestion, 0.8 g may be fatal.

Chronic Exposure Effects: Not available

Overexposure Effects:

Stiffness, immobility of the limbs, leg cramps, central nervous system stimulation, then depression.

Exposure Limits: Inhalation - TLV 0.5 mg/m₃ As Ba

Irritancy: Medium

Mutagenicity: Not available

Carcinogenicity: Not Carcinogenic (IARC and ACGIH)

Sensitization To Product: Not available

Reproductive Toxicity: Not available

Toxicologically Synergistic Materials: Not available

Teratogenicity Data: Not available

Animal Toxicity Data: LD₅₀ (Oral, Rat)

118 mg/kg

FIRST AID MEASURES

Inhalation: Remove to fresh air. Give artificial respiration if necessary. Call physician.

Skin Contact:

Immediately flush skin with water for 15 minutes. Wash with salt. Decontaminate clothing before reusing.

Eye Contact: Immediately flush eyes with water for at least 15 minutes. Call physician.

Ingestion:

Immediately give 1 tablespoon of epsom salt in a glass of water induce vomiting by sticking finger down throat, if necessary. Never give anything by mouth to an unconscious person. Call physician.

PREVENTATIVE MEASURES

Respiratory Protection: Approved dust mask or respirator.

Skin Protection: Rubber gloves and impervious clothing.

Eye/Face Protection: Safety goggles.

Special Handling Procedures:

Avoid all contact with eyes and mouth or with food. No eating or smoking during handling.

Decontaminate before breaks or going home.

Storage Requirements: Store away from acids in a dry area.

Engineering Controls: Local and general.

ENVIRONMENTAL PROTECTION DATA

Steps In The Event Of A Leak Or Spill:

Add an excess of dilute sulphuric acid to a solution of the product in water. Let stand overnight. Remove any insolubles and bury in an approved chemical landfill. Inform proper authorities.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CPHK for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BENZENE****0015****PRODUCT INFORMATION**

Product Name: Benzene

Chinese Name: 苯

Common Synonyms: Benzol; Phenyl Hydride; Coal Naphtha

Chemical Family: Aromatic Hydrocarbons

Formula: C_6H_6

Formula Wt.: 78.10

C.A.S.: 71-43-2

Product Use: Laboratory reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 30 mg/m³ (10 ppm)

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 3 mg/m³ (1 ppm)

PEL (Ceiling) = 25 ppm.

Toxicity Of Components:

Oral Rat LD₅₀ For Benzene

4894 mg/kg

Oral Mouse LD₅₀ For Benzene

4700 mg/kg

Intraperitoneal Rat LD₅₀ For Benzene

2.89 mg/kg

Inhalation Mouse LC₅₀ For Benzene

9980 ppm

Carcinogenicity: NTP: Yes IARC: Yes Z LIST: No OSHA REG: No

Carcinogenicity:

This substance is listed as an acgih suspected human carcinogen, a NTP human carcinogen, and an IARC human carcinogen (group 1)

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation:

Headache, nausea, vomiting, dizziness, narcosis, respiratory failure, low blood pressure, central nervous system depression, severe irritation or burns of respiratory system, pulmonary edema, lung inflammation

Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation, may cause temporary corneal damage

Skin Absorption: None identified

Ingestion:

Headache, nausea, vomiting, dizziness, gastrointestinal irritation, blurred vision, low blood pressure
chronic effects: damage to blood forming tissue

Target Organs: Blood, central nervous system, eyes, skin, bone marrow, respiratory system, lungs

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, inhalation, eye contact, skin contact, absorption

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, do not induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. at concentrations above 10 ppm, a self-contained breathing apparatus is advised.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, polyvinyl alcohol gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. shut off ignition sources; no flames, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapours. take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BENZOIC ACID****0016****PRODUCT INFORMATION**

Product Name: Benzoic Acid

Chinese Name: 苯<甲>酸

Common Synonyms: Carboxybenzene; Benzenecarboxylic Acid; Phenylformic Acid; Dracylic Acid

Chemical Family: Organic Acids

Formula: C_6H_5COOH

Formula Wt.: 122.12

C.A.S.: 65-85-0

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: 249 deg. C (480 deg. F) (@ 760 mmHg) Vapour Pressure (mmHg): <1 (20 deg. C)
Melting Point: 122 deg. C (251 deg. F) (@ 760 mmHg) Vapour Density (Air=1): 4.2
Specific Gravity: 1.32 (H₂O=1) Evaporation Rate: <1 (Butyl Acetate = 1)
Solubility(H₂O): Slight (0.1-1%) % Volatiles By Volume: N/A (21 deg. C)
pH: N/A
Odour Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odour: White crystals. Faint pleasant odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)
Flash Point (Closed Cup): 120 deg. C (250 deg. F)
Flammable Limits: Upper - N/A Lower - N/A
Autoignition Temperature: N/A
Toxic Gases Produced: Carbon monoxide, carbon dioxide
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibles: Strong bases, strong oxidizing agents, alkalies
Decomposition Products: Carbon monoxide, carbon dioxide
Conditions To Avoid: Heat, flame, other sources of ignition, moisture

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Benzoic Acid 2350 mg/kg

Oral Mouse LD₅₀ For Benzoic Acid 2370 mg/kg

Intraperitoneal Mouse LD₅₀ For Benzoic Acid 1460 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None Identified.

Reproductive Effects: None Identified.

Effects Of Overexposure:

Inhalation: Severe Irritation Or Burns Of Mucous Membranes

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None Identified

Ingestion: Gastrointestinal Irritation, Nausea, Vomiting

Chronic Effects: None Identified

Target Organs: None Identified

Medical Conditions Generally Aggravated By Exposure: None Identified

Primary Routes Of Entry: None Indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BORIC ACID****0017****PRODUCT INFORMATION**

Chemical Name: Boric Acid.

Chinese Name: 硼酸

Synonyms: Boracic Acid, Orthoboric Acid.

Chemical Family: Acid.

Molecular Formula: H_3BO_3

C.A.S. : 10043-35-3

Product Use: Glass fibres, boron chemicals, flame retardant, fungus control, ointment and eye wash.

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid.

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The above information is believed to be accurate to the best of our knowledge.
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Odour And Appearance: Odourless, white powder.
Odour Threshold: Not applicable. Vapour Pressure: mmHg/20 deg. C - 15
Vapour Density: Not applicable. Evaporation Rate: <1
Boiling Point: 300 deg. C Melting Point: 171 deg. C
Solubility In Water: 1 - 10 % Molecular Weight: 61.83
Specific Gravity: 1.43
% Volatile By Volume: Not applicable.
Bulk Density: Not available.
Coefficient Of Water/Oil Distribution: Not available.

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Non-Flammable.
Means Of Extinguishing: Not applicable.
Flash Point: Not applicable.
Upper Flammable Limit: Not applicable.
Lower Flammable Limit: Not applicable.
Auto Ignition Temperature: Not applicable.
Hazardous Combustion Products: None Known.
Special Fire Fighting Procedures:
Boric acid is not flammable and does not support combustion. Use fire fighting media suitable for the surrounding fire.

Explosion Hazards: Not applicable.

REACTIVITY DATA

Stability: Stable.
Hazardous Polymerization: Will not occur.
Incompatibility: Potassium, acetic anhydride and heat sources.
Hazardous Decompositions: None known.
Conditions To Avoid: Incompatible materials and heat. Loses water when heated above 100 deg. c.

HEALTH HAZARD DATA

Inhalation: Inhalation will cause irritation of the upper respiratory tract.
Skin Contact:
Contact with skin may cause mild irritation. Avoid allowing product to enter body through skin lesions.

Eye Contact: Contact with eyes can cause mild to severe irritation.

Ingestion:

Ingestion may cause irritation in the mouth, esophagus and stomach. other effects possible include abdominal pain, vomiting and diarrhea.

Chronic Exposure Effects:

Overexposure may lead to irritation of the eyes, mucous membranes, respiratory tract and skin. It may cause weakness, abdominal pain, vomiting and diarrhea.

Exposure Limits: Acgih Nuisance Dust TLV-TWA: 10mg/m³ Total Dust.

Irritancy: Not available.

Sensitization To Product: Not available.

Carcinogenicity: Not Registered. Mutagenicity: Not available.

Reproductive Toxicity: Not applicable.

Toxicologically Synergistic Materials: Not available.

Animal Toxicity Data: LD₅₀: Rat, Oral, 2660 mg/kg.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If victim is not breathing give artificial respiration. Obtain medical attention.

Skin Contact:

Wash area of contact with copius amounts of soap and water. Remove contaminated clothing and wash before reuse. If irritation persists seek medical attention.

Eye Contact:

Flush eyes with running water for minimum of 15 minutes. If irritation persists seek medical attention if irritation persists.

Ingestion:

Immediately induce vomiting by giving 2 glasses of water and sticking finger down throat. Obtain medical attention.

PREVENTATIVE MEASURES

Respiratory Protection:

Use NIOSH/MSHA approved dust and mist respirator if dust concentration exceeds exposure limit.

Skin Protection: Wear gloves when handling the product. Wash clothes after working with product.

Eye/Face Protection: Wear chemical safety goggles or safety glasses.

Special Handling Procedures: Wash thoroughly after handling. Do not get in eyes, on skin or on clothing.

Storage Requirements: Store in a cool, dry, well ventilated area away from incompatible materials.

Engineering Controls: Use local exhaust and general ventilation techniques.

Other Precautions: Treat empty containers as if they are full until they can be thoroughly cleaned.

ENVIRONMENTAL PROTECTION DATA

Steps In The Event Of A Leak Or Spill:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a full facepiece or a half mask air-purifying cartridge respirator with particulate filters. Wear chemical goggles if a half mask is worn. Sweep and shovel up spilled material and dispose of in DOT approved waste containers. Keep out of sewers, storm drains, surface waters and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BROMOBENZENE****0018****PRODUCT INFORMATION**

Chemical Name : Bromobenzene

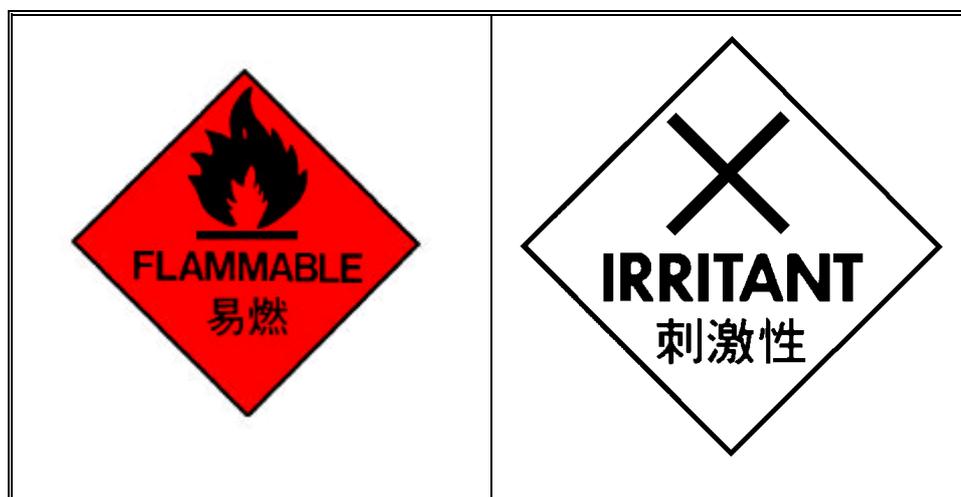
Chinese Name: 溴苯

Chemical Family: Aromatic Hydrocarbon

Chemical Formula: C_6H_5Br

C.A.S.: 108-86-1

Product Use: For Test Purposes

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Odour And Appearance: Colourless liquid with an aromatic odour

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Odour Threshold (ppm): Not available
Vapour Pressure (mmHg): 10 mmHg @ 40 deg. C
Vapour Density (Air=1): 5.441
Evaporation Rate: Not available
Boiling Point : 154-158 deg. C
Freezing Point : -31 deg. C
pH: Not Available
Specific Gravity: 1.497
Coefficient Of Water/Oil Distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Flammable.
Must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.

Extinguishing Media: CO₂, foam, dry powder or vaporizing liquid.
Flash Point (Method Used): 51 deg. C/cc
Upper Flammable Limit (% By Volume): 3.0%
Lower Flammable Limit (% By Volume): .5%
Autoignition Temperature: 566 deg. C
Hazardous Combustion Products: CO_x

REACTIVITY DATA

Stability: Stable
Incompatibility : Oxidizing materials. mixtures of 1-bromo-butane and sodium metal.
Reactivity: Heat, flame, sparks
Hazardous Decomposition Products: Highly toxic fumes of bromine compounds.

HEALTH HAZARD DATA

LD₅₀: (Oral Rat) 2699 mg/kg
LC₅₀: (Inh. Rat) 20 mg/l
Effects Of Acute Exposure To Product:
Inhaled: Irritates. May be aspirated into lungs with the risk of pneumonia and pulmonary injury.
In Contact With Skin: Irritates. Symptoms parallel ingestion. Assumed harmful if absorbed by skin.
In Contact With Eyes: Irritates
Ingested:
Harmful. Ingestion may cause abdominal pain, nausea, vomiting, diarrhea, headache, dullness, central nervous system effects, and death.

Effects Of Chronic Exposure To Product:
Carcinogenicity: No information available
Teratogenicity: No information available
Reproductive Effects: No information available
Mutagenicity: No information available
Synergistic Products: None found

FIRST AID MEASURES

Eyes: Wash thoroughly with water. Get medical advice if irritation develops.

Skin:

Remove contaminated clothing. Wash skin with plenty of water for at least fifteen (15) minutes. If irritation develops seek medical attention.

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Rinse mouth thoroughly with water. Do not induce vomiting. Have victim drink 220-400 ml of water to dilute. seek medical attention.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation recommended

Respiratory Protection: Self-contained breathing apparatus

Eye Protection: Chemical safety goggles or face shield

Skin Protection: Plastic apron, sleeves and boots as appropriate. Nitrile gloves.

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures And Equipment:

Use approved flammable liquid storage containers in the work area. Ground drums and bond transfer containers. Use non-sparking tools. Keep material away from sparks, flames and other ignition sources. Post "no smoking" signs in area of use.

Storage Requirements:

Store in suitable labelled containers. Keep containers tightly closed when not in use and when empty. Protect from damage. Store in a cool, dry, well-ventilated area, out of direct sunlight. Store away from ignition sources.

ENVIRONMENTAL PROTECTION DATA

Leak And Spill Procedure:

Absorb on inert absorbent, transfer carefully into container and arrange removal by disposal company.
Wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BROMINE****0019****PRODUCT INFORMATION**

Chemical Name: Bromine
Chinese Name: 溴
Chemical Family: Halogen Element
Molecular Formula: Br₂
C.A.S. : 7726-95-6

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid
Boiling Point : 137.8 deg. F
Melting Point : N/D

Vapour Pressure, mmHg/20 deg. C: 226
Vapour Density (Air=1): 7.139

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Specific Gravity (Water=1): 3.12 Water Solubility, %: N/D
Appearance And Odour: Crystals or dark red liquid
Evaporation Rate (Butyl Acetate=1): N/D

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Extinguishing Media: Use water spray, dry chemical, CO₂, or alcohol foam.
Flash Point : None
Flammable Limits In Air, % Lower: N/D Upper: N/D
Special Fire Fighting Procedures:
Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards: None.

REACTIVITY DATA

Stability: Stable
Polymerization: Will not occur
Incompatibility:
Reducing agents, combustible materials such as wood, cloth, or organic materials, metals such as iron and copper and their alloys, alkali, and dirt.

Hazardous Decomposition Products: Hydrogen bromide
Conditions To Avoid: None.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, skin or eye contact.
Signs And Symptoms Of Exposure:
Inhalation:
Severe irritation of respiratory and mucous membrane will result, followed by respiratory failure.

Eye Contact:
Vapours, liquid, and mists are extremely corrosive to the eyes. Brief contact of the vapours will be severely irritating. Brief contact of the liquid or mist will severely damage the eyes and prolonged contact may cause permanent eye injury which may be followed by blindness.

Skin Contact:

Vapours, mists, and liquid are extremely corrosive to the skin. Vapours will severely irritate the skin and liquid and mists will severely burn the skin. Prolonged liquid contact will burn or destroy surrounding tissue and death may accompany burns which extend over large portions of the body.

Swallowed:

Vapours, mists, and liquid are extremely corrosive to the mouth and throat. Swallowing the liquid burns the tissues, causes severe abdominal pain, nausea, vomiting, and collapse. Swallowing large quantities can cause death.

Chronic Effects Of Exposure:

May result in areas of destruction of skin tissue or primary irritant dermatitis. Similarly, inhalation of dusts, vapours, or mists may cause varying degrees of damage to the affected tissues and also increasing susceptibility to respiratory illness.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: No data found

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

Other Data: None

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed: Do not induce vomiting. Get immediate medical attention.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the TLV.

Respiratory Protection:

If use conditions generate vapours or mists, wear a niosh-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air purifying cartridge respirator equipped for organic vapours/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped for organic vapours may be satisfactory. In any event, always wear eye protection. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent material, and then pump into DOT-approved waste containers; or absorb with non-combustible sorbent material, place residue in DOT approved waste containers. Keep out of sewers, storm drains, surface waters, and soils. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CARBON DISULPHIDE****0020**

PRODUCT INFORMATION

Chemical Name: Carbon Disulphide

Chinese Name: 二硫化碳

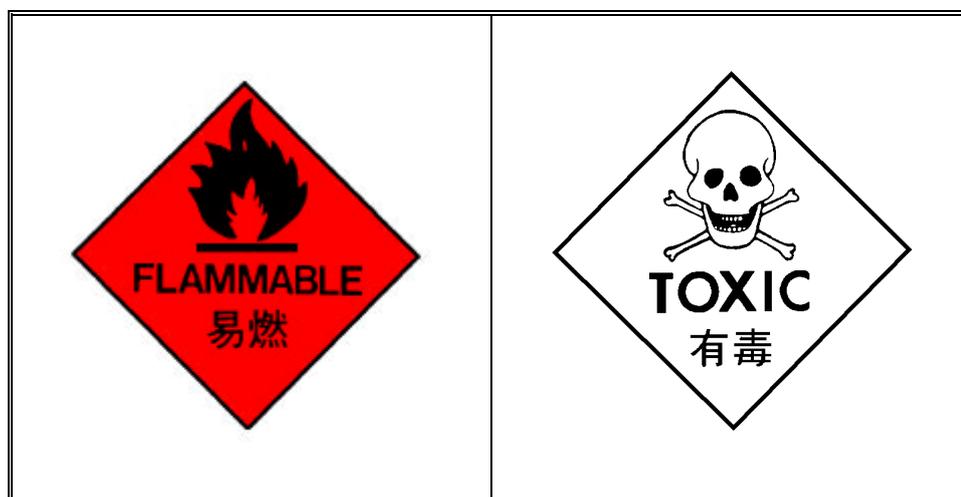
Chemical Family: Inorganic Compound Of Carbon And Sulfur

Chemical Formula: CS₂

C.A.S.: 75-15-0

Product Use: Laboratory solvent

RISK SYMBOL



PHYSICAL DATA

Physical State: Liquid

Odour And Appearance: Clear, colourless or faintly yellow liquid; strong, disagreeable odour

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Odour Threshold (ppm): 0.06 to 0.6 ppm
Vapour Pressure (mmHg): 297.5 @ 20 deg. C
Vapour Density (Air=1): 2.63
Evaporation Rate: 22.6 (N-Butyl Acetate = 1)
Boiling Point : 46.3 deg. C
Freezing Point : -111 deg. C
pH: Not Applicable
Specific Gravity: 1.263 @ 20 deg. C
Coefficient Of Water/Oil Distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Flammable
Extinguishing Media: Carbon dioxide or dry chemical. Water fog or water spray.
Flash Point (Method Used): -30 deg. C (TCC)
Upper Flammable Limit (% By Volume): 44%
Lower Flammable Limit (% By Volume): 1.3%
Autoignition Temperature: 100 deg. C
Hazardous Combustion Products: Burns to release carbon dioxide and sulphur dioxide

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility: Combustible materials, oxidizing materials
Reactivity: Avoid heat, sparks, open flames, friction and hot surfaces
Hazardous Decomposition Products: Burns to release carbon dioxide and sulphur dioxide

HEALTH HAZARD DATA

LD₅₀: not available
LC₅₀: (Inhalation, Mammal) 2000 ppm (5 min)
TLV Units 10 ppm
Effects Of Acute Exposure To Product:
Inhaled:
Irritation of the eyes, nose and respiratory tract, headache, nausea, weak pulse, fatigue, hallucinations, and CNS depression.

In Contact With Skin:
May cause severe irritation, dermatitis, blisters and possibly burns if skin contact is prolonged.

In Contact With Eyes:

Liquid or high vapour concentrations may cause severe irritation, and possible blindness.

Ingested:

May cause numbness in lips, nausea, vomiting, delirium, convulsions, coma and death from respiratory paralysis.

Effects Of Chronic Exposure To Product:

Causes damage to central and peripheral nervous systems and may accelerate the development of, or worsen, coronary heart disease. removal from exposure of workers and coronary risk factors and reduction of levels to 10 ppm caused a dramatic decrease in cardio vascular mortality and return to background levels.

Carcinogenicity: Human data inadequate

Teratogenicity: Not available

Reproductive Effects: Causes irregularities of menstrual cycle and decreased sperm production.

Mutagenicity: No data available

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

Immediately flush eyes with warm running water for a minimum of fifteen (15) minutes. (using any available clean container, pour water in a gentle steady stream, over the eye(s). Position casualty lying on back, face tilted to one side.) Hold eyelids open and away from eyeball while flushing to ensure thorough rinsing. Repeat flushing if irritation persists. Obtain medical advice immediately. (flushing may be continued while casualty is transported to medical facility.)

Skin:

Immediately flush exposed area with large amounts of warm running water while removing contaminated clothing (including rings, watches and shoes). Continue flush the area up to twenty (20) minutes. If irritation persists, repeat flushing and get medical advice.

Inhalation:

Immediately remove casualty from contaminated area to fresh air. (caution must be used by rescuers to avoid exposure to contaminating fumes.) If breathing has stopped give artificial respiration. If breathing and pulse are absent give cpr. Immediately obtain medical attention (call poison control centre). Stay with casualty until medical assistance is reached.

Ingestion:

On advice of poison control centre: if the casualty is alert and not convulsing have them drink 6 to 8 glasses of water to dilute the material. Then immediately call poison control centre with all available information. Obtain medical attention. If spontaneous vomiting occurs, have casualty lean forward to avoid breathing in of emesis. Rinse mouth and administer more water.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation required.

Respiratory Protection:

A niosh/msha approved air-purifying respirator for concentrations up to 100 ppm. Supplied-air respirator for higher concentrations.

Eye Protection: Chemical goggles or faceshield

Skin Protection: Viton gloves, boots, apron or coveralls to protect against splash.

Other Personal Protective Equipment: Viton gloves, boots, apron or coveralls to protect against splash.

Handling Procedures And Equipment:

Keep drums tightly closed and away from fire, combustible materials, sparks, heated surfaces or sunlight. Ground and bond containers during liquid transfer.

Storage Requirements:

Store in drums in cool, dry, well-ventilated location away from combustible materials, sparks or heated surfaces.

ENVIRONMENTAL PROTECTION DATA

Leak And Spill Procedure:

Stop and contain leak or spill. Eliminate ignition sources in area, evacuate upwind, wear protective clothing and use water spray to reduce vapours. Spill may be covered with water and flushed to a CS₂ retention basin where CS₂ is trapped before a water layer for later recovery. minor spills may be absorbed by sand or ashes and covered with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CARBON TETRACHLORIDE****0021****PRODUCT INFORMATION**

Chemical Name: Carbon Tetrachloride

Chinese Name: 四氯化碳

Common Synonyms: Carbon Tet; Tetrachloromethane; Methanetetrachloride; Perchloromethane

Chemical Family: Chlorinated Hydrocarbons

Formula: CCl_4

Formula Wt.: 153.82

C.A.S.: 56-23-5

Product Use: Laboratory reagent

RISK SYMBOL**PHYSICAL DATA**

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Liquid
Boiling Point: 77 deg. C (170 deg. F) Vapour Pressure (mmHg): 91
(@ 760 mmHg) (20 deg. C)
Melting Point: -23 deg. C (-9 deg. F) Vapour Density (Air=1): 5.3
(@ 760 mmHg)
Specific Gravity: 1.59 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odour Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odour: Clear, colourless liquid. Characteristic odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Flash Point (Closed Cup): N/A
Flammable Limits: Upper - N/A Lower - N/A
Autoignition Temperature: N/A
Toxic Gases Produced: Hydrogen chloride, phosgene, chlorine
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibles:
Alkali metals, sodium, potassium, chemically active metals, strong oxidizing agents, allyl alcohol, dimethyl formamide, fluorine, strong bases
Decomposition Products: Hydrogen chloride, chlorine, phosgene
Conditions To Avoid: Heat, flame, other sources of ignition

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 31 mg/m³ (5 ppm)

The TLV Listed Denotes TLV (Skin).

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 12.6 mg/m³ (2 ppm)

Toxicity Of Components:

Oral Rat LD ₅₀ For Carbon Tetrachloride	2800 mg/kg
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Oral Mouse LD ₅₀ For Carbon Tetrachloride	12.8 g/kg
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Intraperitoneal Rat LD ₅₀ For Carbon Tetrachloride	1500 mg/kg
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Skin Rat LD ₅₀ For Carbon Tetrachloride	5070 mg/kg
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Carcinogenicity: NTP: Yes IARC: Yes Z LIST: No OSHA REG: No

Carcinogenicity:

This substance is listed as an acgih suspected human carcinogen, a NTP anticipated human carcinogen, and an IARC probable human carcinogen (groups 2a and 2b).

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation:

Is harmful and may be fatal, headache, nausea, vomiting, dizziness, drowsiness, irritation of upper respiratory tract, unconsciousness

Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation, may cause temporary corneal damage

Skin Absorption: Rapid Absorption

Ingestion:

Is harmful and may be fatal, headache, nausea, vomiting, dizziness, Gastrointestinal irritation, blurred vision, low blood pressure

Chronic Effects: Kidney damage, liver damage

Target Organs: Central nervous system, eyes, skin, lungs, liver, kidneys

Medical Conditions Generally Aggravated By Exposure:

Liver disorders, kidney disorders, alcoholism, central nervous system disorders

Primary Routes Of Entry: Inhalation, ingestion, absorption, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, do not induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial Respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

Notes To Physician: Do not use adrenalin or epinephrine.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. at concentrations above ppm, a self-contained breathing apparatus is advised.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, polyvinyl alcohol gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in secure poison area. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. stop leak if you can do so without risk. Use water spray to reduce vapours. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CHLOROFORM****0022****PRODUCT INFORMATION**

Chemical Name And : Chloroform

Chinese Name: 氯仿, 哥羅芳

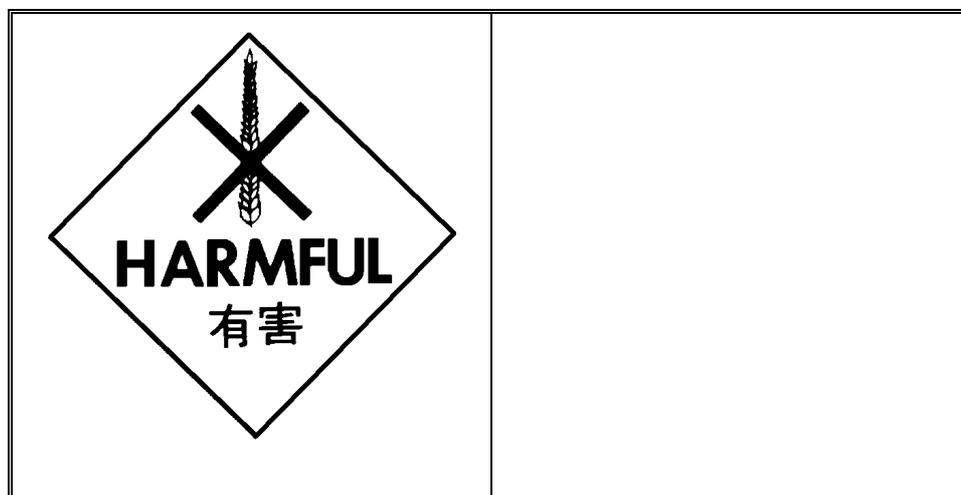
Synonyms: Hydrocarbon Stabilized; Trichloromethane

Chemical Family: Chlorinated Hydrocarbon

Chemical Formula: CHCl_3

C.A.S.: 67663

Product Use: Laboratory Solvent

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Odour And Appearance: Clear, colourless liquid with ether-like odour
Odour Threshold (ppm): 200 ppm
Vapour Pressure (mmHg): 159 mmHg @ 20 deg. C
Vapour Density (Air=1): 4.13
Evaporation Rate: 0.5 (N-Butyl Acetate = 1)
Boiling Point : 61.2 deg. C
Freezing Point : -63.5 deg. C
pH: Not Applicable
Specific Gravity: 1.48
Coefficient Of Water/Oil Distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Non-Flammable
Extinguishing Media: Carbon dioxide, dry chemicals or water spray
Flash Point (Method Used): Non-Flammable
Upper Flammable Limit (% By Volume): Not applicable
Lower Flammable Limit (% By Volume): Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products:
At high temperatures this product decomposes to give off hydrogen chloride gas and small quantities of other toxic and irritating vapours.

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility : Alkali metals
Hazardous Decomposition Products:
At high temperatures this product decomposes to give off hydrogen chloride gas and small quantities of other toxic and irritating vapour.

Condition To Avoid: Open flames, sparks and other sources of ignition.

HEALTH HAZARD DATA

Toxicological Properties And Health Data
Toxicological Data:
LD₅₀: (Oral, Rat) 908 mg/kg
LC₅₀: (Inhalation, Rat) 47,702 mg/m³ 4 hours
Effects Of Acute Exposure To Product:

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Inhaled:

Can cause central nervous system depression, which may progress rapidly to unconsciousness. Moderate irritant of the respiratory tract.

In Contact With Skin: Mildly irritating to skin. May produce a burning sensation.

In Contact With Eyes: Slight irritant of the eyes causing pain, lacrimation and general inflammation.

Ingested:

Can irritate the gastrointestinal tract. May produce chemical pneumonia if vomiting results in aspiration into the lungs. Ingestion can result in serious or fatal results.

Effects Of Chronic Exposure To Product:

Carcinogenicity: Has been evaluated by IARC as a carcinogen

Teratogenicity: Not available

Reproductive Effects: Not available

Mutagenicity: Not available

Synergistic Products: Not available

FIRST AID MEASURES

Eyes:

Immediately flush eyes with warm running water for a minimum of fifteen (15) minutes. (using any available clean container, pour water in a gentle steady stream, over the eye(s). Position casualty lying on back, face tilted to one side.) Hold eyelids open during flushing. Repeat flushing if irritation persists. Obtain medical advice immediately. (flushing may be continued while casualty is transported to medical facility.

Skin:

Immediately flush exposed area with large amounts of warm running water while removing contaminated clothing (including rings, watches and shoes). Continue flushing the area up to twenty (20) minutes. If irritation persists, repeat flushing and get medical advice.

Inhalation:

Immediately remove casualty from contaminated area to fresh air. (caution must be used by rescuers to avoid exposure to contaminating fumes.) If breathing has stopped give artificial respiration. If breathing and pulse are absent give CPR. Immediately obtain medical attention. Stay with casualty until medical assistance is reached.

Ingestion:

Do not induce vomiting. Danger of aspiration with vomiting. If the casualty is alert and not convulsing, rinse out mouth with water. Give 4 to 8 glasses of water to dilute material. Immediately get medical attention. If spontaneous vomiting occurs, have casualty lean forward with head down to avoid breathing in of vomitus.

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PREVENTATIVE MEASURES

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Engineering Controls: local exhaust ventilation recommended.

Respiratory Protection:

Approved air-purifying respirator or self-contained breathing apparatus required for concentrations exceeding TLV.

Eye Protection: chemical safety goggles.

Skin Protection:

PVC gloves, overalls, apron or protective clothing sufficient to prevent contact if splash occurs.

Other Personal Protective Equipment: Safety shower and eyewash fountain in the work area.

Handling Procedures And Equipment:

Avoid contact with eyes, skin and clothing and inhalation of vapours.

Storage Requirements: Store in cool, well-ventilated area away from heat, sparks and open flame.

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ENVIRONMENTAL PROTECTION DATA

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Leak And Spill Procedure:

Evacuate area, provide maximum ventilation. Contain spill and collect using absorbent material. Adequate personal protective equipment and clothing must be worn.

Material Safety Data Sheet

City University of Hong Kong

MSDS CHROMIUM CHLORIDE, 6-HYDRATE 0023**PRODUCT INFORMATION**

Chemical Name: Chromium Chloride, 6-Hydrate

Chinese Name: 氯化鉻(III)

Common Synonyms: Chromium (III) Chloride, Hexahydrate; Chromic Chloride, Hexahydrate

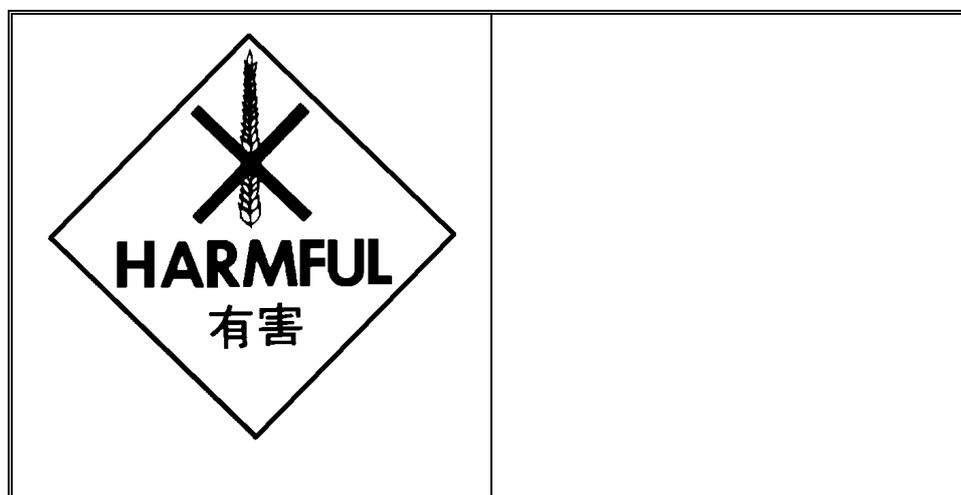
Chemical Family: Chromium Compounds

Formula: $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$

Formula Wt.: 266.45

C.A.S.: 10060-12-5

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

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Permissible Exposure Limit (PEL): 0.5 mg/m³
PEL Is For Chromium (III) Compounds, As Cr.

Toxicity Of Components:

Oral Rat Ld₅₀ For Chromium Chloride, 6-Hydrate 1790 mg/kg
Intraperitoneal Mouse LD₅₀ For Chromium Chloride, 6-Hydrate 520 mg/kg

Carcinogenicity: NTP: Yes IARC: Yes Z LIST: No OSHA REG: No

Carcinogenicity:

Studies indicate Chromium (III) Oxide is not carcinogenic. The national toxicity program (NTP) lists "chromium and certain chromium compounds" as substances known to be carcinogens. Note: levels and specific chromium compounds cannot be identified.

Reproductive Effects: None Identified.

Effects Of Overexposure:

Inhalation:

Respiratory tract ulcers, inflammation of larynx, lungs, gastrointestinal tract, and nasal passages

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Target Organs: Skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. Induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: in case of contact, flush skin with water.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

A respirator with dust/mist filter is recommended. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. with clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CYCLOHEXANOL****0024****PRODUCT INFORMATION**

Chemical Name: Cyclohexanol

Chinese Name: 環己醇

Synonyms: Cyclohexanol

Chemical Family: Alicyclic Alcohols

Formula: $C_6H_{11}OH$

C.A.S.: 108-93-0

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Boiling Point : 322 deg. F

Vapour Pressure, mmHg/20 deg. C: 1

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Melting Point : 75 deg. F
Specific Gravity (Water=1): 0.95
Appearance And Odour:
Clear Colourless Liquid; Solid Below 70 deg. F
Aromatic Camphor-Like Odour

Vapour Density (Air=1): 3.5
Water Solubility, %: 3.6
Evaporation Rate (Butyl Acetate=1): <1

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable

Extinguishing Media: Use water spray, dry chemical, CO₂, or alcohol foam. do not use a direct water stream.

Flash Point : 151 deg. F

Flammable Limits In Air, % Lower: 1.25 Upper: 12.25

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Extinguish all nearby sources of ignition. Vapour is heavier than air and may travel to other ignition sources.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility: Acids, oxidizing materials, and especially nitric acid.

Hazardous Decomposition Products: May liberate carbon monoxide or carbon dioxide.

Conditions To Avoid: Heat, sparks, and open flames.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, skin or eye contact, and swallowing

Signs And Symptoms Of Exposure:

Inhalation:

Vapours and mists irritate the nose, throat, and respiratory tract. Inhalation of higher concentrations may cause headaches, nausea, vomiting, coma, and intestinal disturbances. Inhalation of very high concentrations or prolonged exposure may cause unconsciousness or death.

Eye Contact: Vapours will irritate the eyes. Liquid and mists may severely irritate or damage the eyes.

Skin Contact:

Brief contact may dry the skin. Prolonged or repeated contact may irritate the skin, causing dermatitis. May be absorbed through the skin causing systemic effects similar to inhalation.

Swallowed: Depressant for CNS. May cause reversible or irreversible changes to exposed tissue. Chronic Effects Of Exposure: None reported for humans. Liver and kidney damage in animal tests.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Rat LD₅₀=2060 mg/kg

Dermal: Rabbit LDLO=12 g/kg

Inhalation: Human TCLO=75 ppm

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

Other Data:

A limited foreign epidemiological study showed non-specific disturbances of the autonomic nervous system. These effects have not been observed elsewhere. This product increased the mortality of offspring when pregnant mice were exposed to 1% concentrations.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the pel.

Respiratory Protection:

If use conditions generate vapours or mists, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece air-purifying cartridge respirator equipped for organic vapours/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, neoprene gloves, and neoprene apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Vent container carefully, as needed, to relieve pressure. keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Vapours of this product are heavier than air and will collect in low places, such as pits or degreasers, or other poorly ventilated areas. Do not enter places where vapours are suspected unless special respiratory protection is worn and an observer is present. Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including neoprene boots, neoprene gloves, neoprene apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped for organic vapours may be satisfactory. In any event, always wear eye protection. Extinguish all ignition sources. For small spills or drips, mop or wipe up and dispose of in dot-approved waste containers. For large spills, contain by diking with soil or other non-combustible sorbent material and then pump into DOT-approved waste containers; or absorb with non-combustible sorbent material and place residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

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MSDS**CYCLOHEXANONE****0025****PRODUCT INFORMATION**

Chemical Name : Cyclohexanone

Chinese Name: 環己酮

Chemical Family : Ketone

Formula : $C_6H_{10}O$

Molecular Weight: 98.16

C.A.S : 108-94-1

RISK SYMBOL**PHYSICAL DATA**

Physical State :Liquid

Boiling Point, 760mmHg : 155.6 deg. C

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Vapour Pressure At 20 deg. C : 5.2 mmHg
% Volatiles By Volume : CA 100
Freezing Point : -45.0 deg. C
Vapour Density (Air=1) : 3.4
Specific Gravity (H₂O=1) : @ 20 deg. C 0.95
Evaporation Rate : (BuAc=1) CA 0.3
Solubility In Water : @ 20 deg. C 15%
Appearance And Odour : Clear, colourless liquid with an acetone-like odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Flash Point, (Test Method): 44 deg. C (Tag Closed Cup)
Extinguishing Media : Carbon dioxide, dry chemical, or foam.
Flammable Limits In Air % By Volume: Lower Limit 1.2 Upper Limit 8.1
Auto Ignition Temperature: 420 deg. C
Unusual Fire And Explosion Hazards: None, other than combustibility.
Special Fire Fighting Procedures:
Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers. Keep fire-exposed containers cool with water spray.

REACTIVITY DATA

Stability : Stable
Hazardous Polymerization : Not expected to occur.
Incompatibility : Strong oxidizing agents and strong acids and bases.
Hazardous Decomposition Products :
Incomplete combustion can generate carbon monoxide and other toxic vapours.

Conditions To Avoid : Heat, sparks, open flame, open containers, and poor ventilation.

HEALTH HAZARD DATA

Occupational Exposure Limits	Concentration Immediately Dangerous To Health
OSHA 8-hour PEL - 50 ppm	OSHA/NIOSH Not listed
Ceiling - Not listed	
Peak - Not listed	Odour threshold
ACGIH TLV-TWA - 25 ppm (Skin)	NSC Not listed
TLV-STEL - 100 ppm (15-min)	NIOSH & OHS 0.12 ppm
NIOSH TLV-TWA - 25 ppm	
TLV-C - Not listed	

Primary Routes Of Entry:

Cyclohexanone may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of exposure/signs and symptoms**Inhalation:**

Exposure can cause eye, nose, and throat irritation, headache, nausea, dizziness, narcosis, and unconsciousness.

Eye Contact: Liquid and high vapour concentration can cause irritation and slight corneal clouding.

Skin Contact:

Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin.

Ingestion: Can cause gastrointestinal tract irritation, nausea, drowsiness, and narcosis.

Effects Of Overexposure:

Cyclohexanone is an eye and mucous membrane irritant, primary skin irritant, and central nervous system depressant. Acute exposure irritates the eyes and upper respiratory tract, with high concentrations producing narcosis.

Medical Condition Aggravated By Exposure:

Preclude from exposure those individuals susceptible to dermatitis.

FIRST AID MEASURES

Inhalation:

Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact:

Rinse with copious amounts of water for at least 15 minutes. Get Emergency medical assistance.

Skin Contact:

Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion:

Call local poison control centre for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

PREVENTATIVE MEASURES

Ventilation:

Adequate ventilation is required to protect personnel from exposure to chemical vapours exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory:

Use approved respirator equipment. Follow niosh and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes:

Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin:

Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. generally, neoprene offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to cyclohexanone may require additional protective equipment.

Storage:

Cyclohexanone should be protected from temperature extremes and direct sunlight. Proper storage of cyclohexanone must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, cyclohexanone should be stored in an acceptably protected and secure toxic storage room.

Other:

Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure.

ENVIRONMENTAL PROTECTION DATA

Spill Control:

Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHYLENE CHLORIDE****0026****PRODUCT INFORMATION**

Chemical Name : Methylene Chloride

Chinese Name: 亞甲基氯

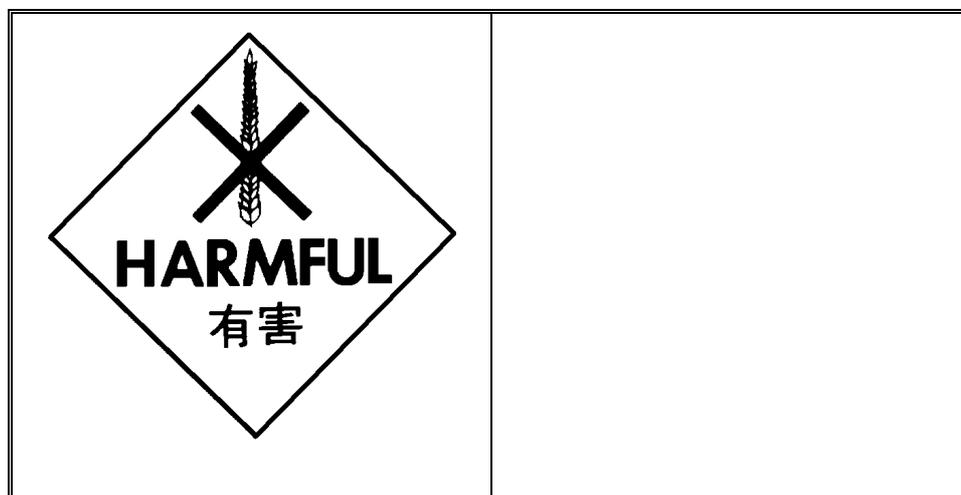
Synonyms : Dichloromethane, Methylene Dichloride

Chemical Family : Chlorinated Hydrocarbon

Formula : CH_2Cl_2

Molecular Weight : 84.93

C.A.S : 75-09-2

RISK SYMBOL**PHYSICAL DATA**

Physical State : Liquid

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Boiling Point, 760mmHg. : 39.75 deg. C
Vapour Pressure At 20 deg. C : 350 mmHg
% Volatiles By Volume : CA 100
Freezing Point : -95.14 deg. C
Vapour Density (Air=1) : 2.9
Specific Gravity (H₂O=1) : @ 20 deg. C 1.33
Evaporation Rate : (Ether=1) CA 0.7
Solubility In Water : @ 20 deg. C 1.6%
Appearance And Odour : Clear, colourless liquid with a sweet ether-like odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Nonflammable

Extinguishing Media:

Use dry chemical, carbon dioxide, foam, or water spray as appropriate for surrounding fire and materials.

Flash Point, (Test Method) None (Closed Cup)

Flammable Limits In Air % By Volume: Lower Limit 12.0 Upper Limit 19.0

Auto Ignition Temperature 556 deg. C

Unusual Fire And Explosion Hazards :

Concentrated vapours can be ignited by high intensity heat source or flame. Toxic and corrosive gases are formed on contact with flames or hot glowing surfaces.

Special Fire Fighting Procedures:

Non-flammable material. Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers. Keep fire-exposed containers cool with water spray.

REACTIVITY DATA

Stability : Stable

Hazardous Polymerization : Not expected to occur.

Incompatibility : Active metals and strong alkaline solutions.

Hazardous Decomposition Products : Phosgene, hydrogen chloride, and chlorine.

Conditions To Avoid : Heat, sparks, open flame, open containers, poor ventilation, and moisture.

HEALTH HAZARD DATA

Occupational Exposure Limits		Concentration Immediately Dangerous To Health	
OSHA 8 Hour PEL	- 500 ppm	OSHA/NIOSH	5,000 ppm
Ceiling	- 1000 ppm		
Peak	- 2000 ppm		
		Odour Threshold	
ACGIH TLV-TWA	- 100 ppm	NSC	200 ppm
TLV-STEL (15 min)	- 500 ppm		

Niosh Lowest Feasible Limit

Carcinogenic Data:

Methylene chloride is listed as a suspected human carcinogen by acgih and as an animal carcinogen by IARC and NTP.

Primary Routes Of Entry:

Methylene chloride may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route Of Exposure/Signs And Symptoms

Inhalation:

Exposure can cause light-headedness, vertigo, drowsiness, narcosis, headache and dizziness, unconsciousness, and even death in extreme cases. Exposure to vapours can elevate carboxyhemoglobin levels in the cardiovascular system.

Eye Contact:

Liquid or high vapour concentration can cause pain and irritation with slight corneal injury possible.

Skin Contact:

Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin. Prolonged contact can result in skin absorption.

Ingestion: can cause burning of throat and mouth.

Effects Of Overexposure:

Acute inhalation or ingestion causes mild central nervous system depression. The primary toxic effect is narcosis. Other toxic effects are pulmonary edema, encephalopathy, and hemolysis. Methylene chloride irritates the eyes, skin and respiratory tract. No systemic effects have been reported in humans, although excessive concentrations have caused cancer and liver and kidney damage in animals.

Medical Condition Aggravated By Exposure:

Preclude from exposure individuals with diseases of liver, kidneys, cardiovascular and central nervous systems, and heavy smokers. simultaneous exposure to methylene chloride and alcohol can increase the toxic hazards of methylene chloride.

FIRST AID MEASURES

Inhalation:

Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact:

Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact:

Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion:

Call local poison control centre for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

PREVENTATIVE MEASURES

Ventilation:

Adequate ventilation is required to protect personnel from exposure to chemical vapours exceeding the PEL. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory:

Use approved respirator equipment. Follow niosh and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes:

Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin:

Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, viton, polyvinyl alcohol, or neoprene offer acceptable chemical resistance. Individuals who are acutely and specifically sensitive to methylene chloride may require additional protective equipment.

Storage:

Methylene chloride should be protected from moisture, temperature extremes and direct sunlight. Proper storage of methylene chloride must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, methylene chloride should be stored in a cool, well ventilated and secure toxic storage room.

Other:

Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure.

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ENVIRONMENTAL PROTECTION DATA
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Spill Control:

Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ETHYL ETHER****0027****PRODUCT INFORMATION**

Chemical Name: Ethyl Ether

Chinese Name: 乙醚

Synonyms: Ether; Diethyl Ether; Ethyl Oxide; Sulfuric Ether

Chemical Family : Ether

Formula: $C_2H_5OC_2H_5$

C.A.S.: 60-29-7

RISK SYMBOL**PHYSICAL DATA**

Physical State : Liquid

Boiling Point : 94.1 deg. F

Vapour Pressure, mmHg/20 deg. C: 439

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Melting Point : -176.8 deg. F Vapour Density (Air=1): 2.55
Specific Gravity (Water=1): 0.71 Water Solubility, %: 6.9
Appearance And Odour: Clear colourless liquid; sweet pungent odour.
Evaporation Rate (Butyl Acetate=1): 37.5

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable

Flash Point : <0

Extinguishing Media:

Use water spray, dry chemical, CO₂, alcohol or polymer foam. Water may be ineffective.

Flammable Limits In Air, Lower: 1.9 Upper: 48

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Because of the material's low boiling point, it may be best to treat this chemical as a gas. Exercise caution to avoid contact between ether vapour and streamlines and other hot metal surfaces. Vapours are heavier than air and may travel a considerable distance to ignition sources and flash back. In the presence of oxygen or on long standing or exposure to sunlight in bottles, unstable peroxides sometimes form which may explode spontaneously or when heated.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Material forms peroxides in the presence of air. The peroxides may be explosive.

Incompatibility:

Strong oxidizing agents, triethylaluminum and air, trimethylaluminum and air, lithium aluminum hydride, and acetyl peroxide

Hazardous Decomposition Products: Peroxides.

Conditions To Avoid: Heat, sparks, open flames, exposure to light and prolonged exposure to air.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, skin or eye contact.

Signs And Symptoms Of Exposure:

Inhalation:

Vapours and mists irritate the nose and throat. Inhalation of higher concentrations may cause headaches, nausea, vomiting, dizziness, and coma. Inhalation of very high concentrations or prolonged exposure may cause unconsciousness or death.

Eye Contact: Vapours will irritate the eyes. Liquid and mists will irritate and may burn the eyes.

Skin Contact:

No irritation is likely after brief contact but may be irritating after prolonged contact. Covered contact may cause burns.

Swallowed:

Swallowing large quantities causes headaches, nausea, vomiting, dizziness, stupor, intoxication, and perhaps unconsciousness.

Chronic Effects Of Exposure: Prolonged exposure may result in respiratory failure and death.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Rat LD₅₀ = 1.7 g/kg; Human LDLO = 420 mg/kg

Dermal: None found

Inhalation: Rat LC₅₀ = 73,000 ppm/150 min.

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration

Other Data: None

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FIRST AID MEASURES

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If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the PEL.

Respiratory Protection:

If use conditions generate vapours or mists, wear a niosh-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator equipped for organic vapours/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Handling And Storage Precautions:

Keep away from heat, sparks, and flames. Store in a cool, dry, well-ventilated place away from incompatible materials. Keep air out of the container. Electrically ground all equipment when handling this product and use only non-sparking tools. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

Other Precautions:

Distillation, evaporation, or exposure to light will accelerate peroxide formation. Addition of reducing agents or water tend to lessen peroxide formation.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped for organic vapours may be satisfactory. In any event, always wear eye protection. Extinguish all ignition sources and ensure that all handling equipment is electrically grounded. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent materials and then pump into DOT-approved waste containers; or absorb with non-combustible sorbent material, place residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

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MSDS**DIPHENYLAMINE****0032****PRODUCT INFORMATION**

Chemical Name: Diphenylamine

Chinese Name: 二苯胺

Synonyms: Dpa, Phenylaniline, Biphenylamine

Chemical Family: Aromatic Amine

Molecular Formula: $(C_6H_5)_2NH$

C.A.S.: 122-39-4

Product Use: Stabilizer for perfume, explosives

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

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Appearance And Odour: Floral odour, brown flake which may darken slowly on storage.
Odour Threshold: Not available
Boiling Range : 302 deg. C @ 760 mmHg
Melting/Freezing Point : 52.9 deg. C @ 760 mmHg
Vapour Pressure: 1 mmHg @ 109 deg. C
Specific Gravity: 1.16
Vapour Density: No data
Bulk Density: Not applicable
Evaporation Rate: No data
Solubility: Soluble in water; also ethanol, benzene and aqueous mineral acid solutions
% Volatile By Volume: 100%
pH: No data
Coefficient Of Water/Oil Distribution: Not available
Rate Of Burning: Not available
Explosive Power: Not available

FIRE AND EXPLOSION DATA

Condition Of Flammability: Not application
Fire Extinguishing Media: Water, carbon dioxide, dry chemical, foam
Flash Point (Method): 153 deg. C (Closed Cup)
Flammability Limits In Air (%): Uel: Not applicable Lel: Not applicable
Autoignition Temperature: 643 deg. C
Fire Fighting Procedures:
The material will burn if ignited. Sand or earth can be used on small isolated fires. Larger fires may be extinguished with water, carbon dioxide, dry chemical or foam.

Other Fire Or Explosion Hazards:
Materials release toxic vapours or gases on thermal decomposition. Full protective equipment, including a self-contained breathing apparatus, should be worn when material is involved in fire.
Possibility of formation of flammable dust clouds.

REACTIVITY DATA

Stability:
Under Normal Conditions: Stable
Under Fire Conditions: Stable
Hazardous Polymerization: Will not occur
Incompatibility: Oxidizing materials
Hazardous Decomposition Or Combustion Products:
Thermal decomposition will cause the release of toxic gases or vapours.

Conditions To Avoid: High temperatures

HEALTH HAZARD DATA

Recommended Exposure Limit: ACGIH TLV/TWA: 10 mg/m³

Toxicological Data: LD₅₀ (Oral, Guinea Pig) = 300 mg/kg (1)

Carcinogenicity Data:

A potential impurity of this product, 4-aminodiphenyl, is listed by acgih (american conference of governmental industrial hygienists) as a substance associated with industrial processes, recognized to have carcinogenic potential. Concentrations of 4-aminodiphenyl in this product are controlled and do not exceed 20 ppm.

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.

Teratogenicity Data: No information is available and no adverse teratogenic effects are anticipated.

Synergistic Materials: None known

Effects Of Exposure When:

Inhaled:

Dust is irritating to the nose, throat and respiratory tract, and may cause coughing and sneezing, central nervous system (CNS) depression, bladder irritation, tachycardia, and systemic poisoning. (see "other health effects")

In Contact With The Skin:

Dust may cause mild irritation of the intact skin and possible sensitization. May be absorbed through intact skin causing central nervous system (CNS) depression, bladder irritation, increased pulse rate and systemic poisoning.

In Contact With The Eyes:

May cause irritation, corneal burns, conjunctivitis, and possible corneal damage.

Ingested:

May cause irritation and burning of the mouth, throat and respiratory tract and abdominal pain. Can cause central nervous system (CNS) depression, bladder irritation, tachycardia, and systemic poisoning. (see "other health effects")

Other Health Effects:

Cns depression is characterized by headache, dizziness, drowsiness, nausea, vomiting, abdominal pain and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure. Animal studies have shown that exposure to diphenylamine may cause methemoglobinemia and damage to the liver, kidney, heart and spleen. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy blue, almost black, lips, tongue, and mucous membranes, with skin colour being slate gray. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress, and death due to anoxia.

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FIRST AID MEASURES

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Inhaled:

Move victim to fresh air. Stay with victim and have a second rescuer obtain oxygen equipment and call an ambulance. Oxygen should be administered by trained personnel. Give artificial respiration only if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing and no pulse. Obtain medical attention immediately.

In Contact With The Skin:

Flush skin with running water then continue flushing with running water for a minimum of 20 minutes. Start flushing while removing contaminated clothing. If irritation persists, repeat flushing. Obtain medical attention immediately.

In Contact With The Eyes:

Immediately flush eyes with running water for a minimum of 20 minutes. hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention immediately.

Ingested:

If victim is alert and not convulsing, give 1/2 to 1 glass of water to dilute material. Immediately contact local poison control centre. vomiting should be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Immediately transport victim to an emergency facility.

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PREVENTATIVE MEASURES

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Recommendations listed in this section indicate the type of equipment which will provide protection against overexposure to this product. conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: local exhaust ventilation required.

Respiratory Protection:

A niosh/msha approved air-purifying respirator equipped with organic vapour cartridges for concentrations up to 10 mg/m³. An air-supplied respirator if concentrations are higher or unknown.

Skin Protection: Gloves found to be impervious under conditions of use.

Eye Protection: Use chemical safety goggles when there is potential for eye contact.

Other Personal Protective Equipment: Impervious clothing as required.

Handling Procedures And Equipment: Not applicable

Storage Temperature (deg. C): Not critical

Storage Requirements: Store in cool, dry, well-ventilated area.

Other Precautions: The creation of flammable dust clouds should be avoided.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Leak:

Stop discharge and contain run-off from rainwater by diking (eg. Earth) for release to land, or contain discharge by damming and water diversion if possible for release to water. Collect product and contaminated soil and water for recovery or disposal.

Environmental Effects:

Harmful to aquatic life at low concentrations. May be an aesthetic nuisance due to colour. No quantitative data are available.

Deactivating Chemicals: None known

Material Safety Data Sheet

City University of Hong Kong

MSDS POTASSIUM PHOSPHATE, DIBASIC 0033

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PRODUCT INFORMATION

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Chemical Name: Potassium Phosphate, Dibasic

Chinese Name: 磷酸氫鉀

Common Synonyms: Dipotassium Hydrogen Phosphate

Chemical Family: Potassium Compounds

Formula: K_2HPO_4

Formula Wt.: 174.18

CAS NO.: 7758-11-4

Product Use: Laboratory Reagent

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RISK SYMBOL=====

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odour Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odour: White powder.

Vapour Pressure (mmHg): N/A
Vapour Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Condition Of Flammability: Nonflammable
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Flash Point (Closed Cup): N/A
Flammable Limits: Upper - N/A Lower - N/A
Autoignition Temperature: N/A
Toxic Gases Produced: Oxides of phosphorus
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibles: None identified
Decomposition Products: Oxides of phosphorus
Conditions To Avoid: None documented

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation: None identified

Skin Contact: None identified

Eye Contact: None identified

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**ETHANOL****0034**

PRODUCT INFORMATION

Chemical: Ethanol

Chinese Name: 乙醇

Synonyms: Ethyl Alcohol

Chemical Family: Alcohols

Formula: C₂H₅OH

Molecular Weight: 46.07

C.A.S.: 64-17-5

RISK SYMBOL



PHYSICAL DATA

Physical State: Liquid

City University of Hong Kong

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Solubility (%): Complete
Boiling Point Of Product: 78.2 deg. C (172.8 deg. F) @ 760 mmHg
Vapour Pressure Of Product: 43 mmHg @ 20 deg. C
Vapour Density Of Product: 1.6 (Air = 1)
Specific Gravity Of Product: 0.8107 @ 20/20 deg. C (H₂O=1)
Percent Volatile (%): 100 (By Volume)
Evaporation Rate: 3.2 (Butyl Acetate = 1)
Freezing Point: Below -123 deg. C (-189 deg. F)

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable

Extinguishing Media:

Alcohol-type foam applied by manufacturers' recommended techniques for large fires; carbon dioxide or dry chemical for small spill fires

Flash Point Of Product: 62 deg. F (Tag Closed Cup); 74 deg. F (Tag Open Cup)

Lower Explosive Limit: 3.3% (By Volume)

Upper Explosive Limit: 19.0% (By Volume)

Special Fire Fighting Procedures:

Addition of water spray (fog) may reduce intensity of the flames. Use self-contained breathing apparatus and protective clothing.

Unusual Fire/Explos Hazards:

Vapours form from this product and may travel or move by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equip., Static discharges, or other ignition sources at locations distant from handling point

REACTIVITY DATA

Stability: Stable.

Hazardous Polymerization: Will not occur.

Incompatibility: : None

Hazardous Combustion Or Decomposition Products:

Burning can produce carbon monoxide and/or carbon dioxide

Conditions To Avoid: Heat, fire, ignition sources.

HEALTH HAZARD DATA

TLV'S: 1000 ppm, ACGIH 1984-5; OSHA 29 CFR PARA. 1910.1000 TABLE Z-1

Effects Of Acute Overexposure:

Eye Contact: Minor irritation

Skin Contact: No evidence of adverse effects from available information.

Skin Absorption: No evidence of adverse effects from available information.

Inhalation: May cause dizziness, drowsiness, nausea and vomiting

Ingestion:

Dizziness, drowsiness, decreased reaction, euphoria, nausea, vomiting, staggering gait, and coma

Effects Of Repeated Overexposure: No evidence of adverse effects from available information

Other Health Hazards: none currently known

FIRST AID MEASURES

Eye Contact: Immediately flush eyes with water for at least 15 minutes. Call a physician.

Skin Contact: Flush with water

Inhalation: Remove to fresh air

Ingestion: Give two glasses of water and induce vomiting

Notes To Physician:

Treatment of overexposure should be directed at the control of symptoms and the clinical condition

PREVENTATIVE MEASURES

Eye Protection: Safety glasses

Skin Protection: Protective gloves: neoprene

Respiratory Protection: Self-contained breathing apparatus in high concentrations

Ventilation Requirements:

This product should be confined within closed equipment, in which case general (mechanical) room ventilation should be suitable. Special, local ventilation is needed at points where vapours are expected to be vented to the workplace air.

Other Protective Equipment: Eye bath, safety shower

Storage And Handling:

Keep away from heat, sparks, and flame. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. Avoid breathing vapours.

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ENVIRONMENTAL PROTECTION DATA

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Cleanup:

Extinguish and do not turn on any ignition source until area is determined to be free from explosion or fire hazards. Collect large spills for disposal. Flush small spills with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ETHYL ACETATE****0035****PRODUCT INFORMATION**

Chemical Name : Ethyl Acetate

Chinese Name: 醋酸乙酯

Synonyms : Ethyl Ethanoate, Acetic Acid Ethyl Ester

Chemical Family : Ester

Molecular Formula : $C_2H_5COOCH_3$

Molecular Weight : 88.11

C.A.S : 141-78-6

RISK SYMBOL**PHYSICAL DATA**

Physical State : Liquid

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Boiling Point, 760mmHg. : 77.11 deg. C
Vapour Pressure At 20 deg. C : 73.0 mmHg
% Volatiles By Volume : CA 100
Freezing Point : -83.97 deg. C
Vapour Density (Air=1) : 3.0
Specific Gravity (H₂O=1) : @ 20 deg. C 0.901
Evaporation Rate : (BuAc=1) Ca 5
Solubility In Water : @ 20 deg. C 8.7%
Appearance And Odour : Clear, colourless liquid with a characteristic fruity odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Extinguishing Media: Carbon dioxide, dry chemical, or alcohol foam.
Flash Point, (Test Method) -4 deg. C (Tag Closed Cup)
Flammable Limits In Air % By Volume: Lower Limit 2.2 Upper Limit 11.5
Auto Ignition Temperature 426 deg. C
Special Fire Fighting Procedures :
Wear full protective clothing and self-contained breathing apparatus. heat will build pressure and rupture closed storage containers. Keep fire-exposed containers cool with water spray.

REACTIVITY DATA

Stability : Stable
Hazardous Polymerization : Not expected to occur.
Incompatibility : Strong oxidizing agents and strong acids and bases.
Hazardous Decomposition Products :
Incomplete combustion can generate carbon monoxide and other toxic vapours.

Conditions To Avoid : Heat, sparks, open flame, open containers, and poor ventilation.

HEALTH HAZARD DATA

Occupational Exposure Limits		Concentration Immediately Dangerous To Health	
OSHA TWA	- 400 ppm	OSHA/NIOSH	10,000 ppm
STEL	- Not Listed		
CEILING	- Not Listed		
Odour Threshold			
ACGIH TLV-TWA	- 400 ppm	NSC NIOSH	10 ppm 50 ppm
TLV-STEL	- Not Listed		

Carcinogenic Data: Ethyl acetate is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Primary Routes Of Entry:

Ethyl acetate may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of exposure/signs and symptoms

Inhalation:

Exposure can cause respiratory irritation, headache, nausea, liver and kidney damage and pulmonary edema.

Eye Contact:

Liquid and high vapour concentration can cause irritation, conjunctivitis, and corneal clouding.

Skin Contact:

Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of the skin.

Ingestion: can cause irritation of gastrointestinal tract.

Effects Of Overexposure:

Ethyl acetate is a mild eye and mucous membrane irritant, primary skin irritant and central nervous system depressant. Repeated contact with ethyl acetate produces eczematous and sensitization dermatitis. Acute inhalation may produce narcosis, anemia, liver and kidney damage, and pulmonary edema.

Medical Condition Aggravated By Exposure:

Preclude from exposure those individuals with diseases of eyes, liver, kidneys, lungs and those susceptible to dermatitis.

FIRST AID MEASURES

Inhalation:

Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact:

Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact:

Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion:

Call local poison control centre for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

PREVENTATIVE MEASURES

Ventilation:

Adequate ventilation is required to protect personnel from exposure to chemical vapours exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory:

Use approved respirator equipment. Follow niosh and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes:

Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin:

Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or natural rubber offer acceptable chemical resistance. Individuals who are acutely and specifically sensitive to ethyl acetate may require additional protective equipment.

Storage:

Ethyl acetate should be protected from temperature extremes and direct sunlight. Proper storage of ethyl acetate must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, ethyl acetate should be stored in an acceptably protected and secure flammable liquid storage room.

Other:

Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

ENVIRONMENTAL PROTECTION DATA

Spill Control:

Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ETHYLENEDIAMINE****0036****PRODUCT INFORMATION**

Chemical Name: Ethylenediamine

Chinese Name: 乙二胺-[1,2]

Synonyms: Ethylenediamine; 1,2-Ethanediamine; EDA; EDA-HP; EDA-UHP

Formula: $\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$

C.A.S.:107-15-3

RISK SYMBOL**PHYSICAL DATA**

Physical State : Liquid

Boiling Point : 243.1 deg. F

Melting Point : 52 deg. F

Vapour Pressure, mmHg/20 deg. C: 10

Vapour Density (Air=1): 2.07

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Specific Gravity (Water=1): 0.898 @ 20/20 deg. C Water Solubility, %: 100
Evaporation Rate (Butyl Acetate=1): 0.91
Appearance And Odour: Water-white liquid; strong amine odour

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Extinguishing Media: Use water spray, dry chemical, CO₂, or alcohol foam.
Flash Point : 108 deg. F Tag open cup
Flammable Limits In Air, % Lower: 4.2 Upper: 14.4

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire. Do not direct a solid stream of water or foam into hot, burning pools; this may cause splattering and increase fire intensity.

Unusual Fire And Explosion Hazards:

Extinguish all nearby sources of ignition. Vapours may under go spontaneous combustion when mixed with air.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility:

Acids, oxidizing materials, chlorinated organic compounds, nitromethane, and copper and its alloys. Also avoid contamination with epoxides, aldehydes, ketones, acryketes and organic halides.

Hazardous Decomposition Products:

May liberate carbon monoxide, carbon dioxide, oxides of nitrogen, and ammonia.

Conditions To Avoid:

Heat, sparks, and open flames. Some decomposition can occur upon vigorous heating.

HEALTH HAZARD DATA

Primary routes of exposure: skin or eye contact, inhalation.

Signs And Symptoms Of Exposure:**Inhalation:**

Vapours are irritating and may cause nausea, vomiting, and sensitization of the respiratory tract. Repeated exposure to high vapour concentrations may cause liver and kidney damage. Vapours are irritating and may cause excessive tear formation, burning sensation of the nose and throat, coughing, wheezing, shortness of breath, nausea and vomiting. Extremely high vapour concentrations may cause lung damage. some individuals may develop asthma.

Eye Contact:

Vapours, liquid, and mists are extremely corrosive to the eyes. Brief contact of the vapours will be severely irritating. Brief contact of the liquid or mists will severely damage the eyes and prolonged contact may cause permanent eye injury which may be followed by blindness. Exposure to the vapour may cause minor transient edema of the corneal epithelium. this condition, referred to as "glauropsia", "blue haze" or "blue-grey haze" produces a blurring of vision against a general bluish haze and the appearance of halos around bright objects. The effect disappears spontaneously within a few hours of the end of an exposure, and leaves no sequelae. Although not detrimental to the eye per se, glauropsia predisposes an affected individual to physical accidents, and reduces the ability to undertake skilled tasks such as driving a motorized vehicle.

Skin Contact:

Causes chemical burns. A strong sensitizer which may cause skin rash. prolonged or repeated exposure may result in absorption of harmful amounts.

Swallowed:

Swallowing large quantities causes headaches, nausea, vomiting, and perhaps unconsciousness. Moderately toxic. May also cause dizziness, weakness, thirst, collapse and possible coma. The severity and nature of these disorders depends on the amount swallowed.

Chronic Effects Of Exposure:

Exposure may sensitize the skin or respiratory tract. Repeated inhalation or skin contact may also cause an allergic response such as a skin rash or asthma. May cause liver and kidney damage.

Medical Conditions Generally Aggravated By Exposure:

Persons with preexisting asthma, allergies, or known sensitization to ethylenediamine may be more susceptible to the effects of this product. it may aggravate existing dermatitis. Breathing of vapour and mists may aggravate inflammatory or fibrotic pulmonary disease.

Oral: Rat LD₅₀ = 1,160 mg/kg

Dermal: Rabbit LD₅₀ = 730 mg/kg

Inhalation: Human TCLO = 200 ppm (Irritant Effects)

Rat LCLO = 4,000 ppm / 8 hr

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 30 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 30 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

Notes To Physician:

There is no specific antidote. Treatment should be directed at the control of symptoms and the clinical conditions. Due to the irritant nature of the material, the stomach should be evacuated carefully in cases of poisoning by swallowing.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the PEL.

Respiratory Protection:

If use conditions generate vapours or mists, wear a niosh-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece air-purifying cartridge respirator equipped for organic vapours/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles and full faceshield unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing:

Long-sleeved shirt, trousers, safety shoes, butyl rubber gloves or neoprene gloves and apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Vent container carefully, as needed, to relieve pressure. keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Keep away from heat, sparks, and flames.

Danger:

Causes eye and skin burns. Harmful if inhaled or absorbed through skin. harmful and corrosive if swallowed. May cause liver and kidney damage. may cause allergic skin reaction. May cause asthma with possible long-term lung damage. Aspiration may cause lung damage. Combustible.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Warning:

Hot organic chemical vapours or mists are susceptible to sudden spontaneous combustion when mixed with air.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full. Avoid discharge to sewers or natural waters because this product is toxic to fish and is biodegradable only in very low concentrations (about 10 ppm).

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear alkali-resistant slicker suit and complete protective equipment including butyl rubber boots, butyl rubber gloves, butyl rubber apron, and a self-contained breathing apparatus in the pressure demand mode or supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped for organic vapours may be satisfactory. In any event, always wear eye protection. Extinguish all ignition sources. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible sorbent material and then pump into DOT-approved waste containers; or absorb with non-combustible sorbent material and place residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil. Small spills could be flushed with large amounts of water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**FERRIC CHLORIDE, SOLID****0038****PRODUCT INFORMATION**

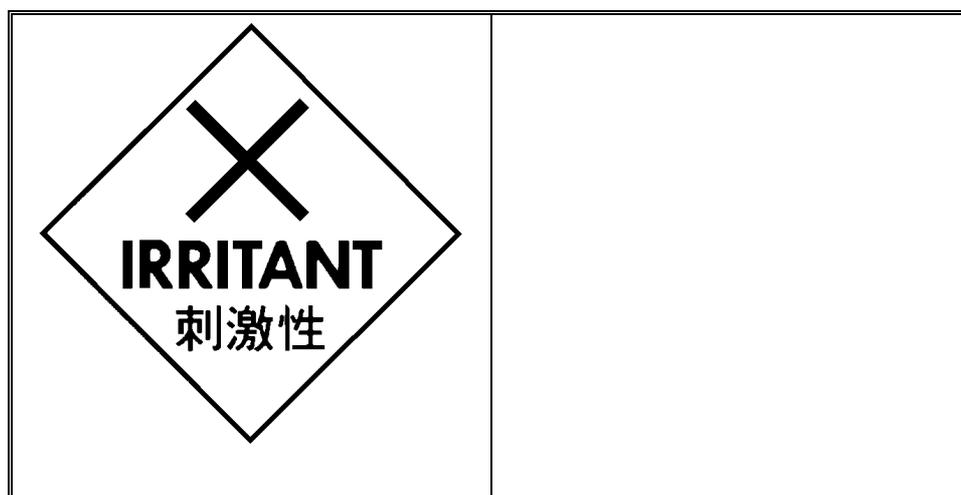
Chemical Name: Ferric Chloride

Chinese Name: 氯化鐵

Synonyms : Iron (III) Chloride

Formula: $\text{FeCl}_3 \cdot 6(\text{H}_2\text{O})$

C.A.S.: 7705-08-0

RISK SYMBOL**PHYSICAL DATA**

Physical State : Solid

Boiling Point, : 580-609 deg. F

Vapour Pressure, mmHg/20 deg. C: Not applicable

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Melting Point, : 574 deg. F
Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): 2.8-2.9
Water Solubility, %: 50
Evaporation Rate (Butyl Acetate=1): <1
Appearance And Odour: Greenish-black solid

FIRE AND EXPLOSION DATA

Condition Of Flammability: Nonflammable

Extinguishing Media:

This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Flash Point : None

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

This product may release toxic chlorine gas at temperatures above 553 deg. F

REACTIVITY DATA

Stability: Stable

Lymerization: Will not occur

Incompatibility : Keep water and moist air out of the container.

Hazardous Decomposition Products: May release chlorine gas at elevated temperatures.

Conditions To Avoid: None

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact

Signs And Symptoms Of Exposure:

Inhalation:

Dusts are extremely corrosive to the entire respiratory tract. Breathing dust can destroy the mucous membranes and can cause severe pneumonitis.

Eye Contact:

Dusts are extremely corrosive to the eyes. Brief contact causes severe eye damage and prolonged contact causes permanent eye injury which may be followed by blindness.

Skin Contact:

Dusts are extremely corrosive to the skin and rapidly cause severe chemical burns. Moisture on the skin, such as from perspiration, will accelerate tissue destruction.

Swallowed:

Dusts or solids are extremely corrosive to the mouth and throat. swallowing dusts or solids causes severe and rapid burning of the mouth, throat, and digestive tract accompanied by severe pain, vomiting and collapse.

Chronic Effects Of Exposure: Ingestion may result in severe liver and/or kidney damage.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Mouse LD₅₀ = 1278 mg/kg

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, Lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection:

Wear a niosh-approved respirator appropriate for the dust concentration at the point of use. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing:

Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron. Other protective measures: an eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags or fibre drums dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a full facepiece or a half mask air-purifying cartridge respirator with particulate filters. Wear chemical goggles if a half mask is worn. For small spills, sweep up and dispose of in dot-approved waste containers. For large spills, shovel into dot-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**FORMIC ACID****0039****PRODUCT INFORMATION**

Product Name: Formic Acid
Chinese Name: 蟻酸
Common Synonyms: Hydrogen Carboxylic Acid
Chemical Family: Organic Acids
Formula: HCOOH
Formula Wt.: 46.03
C.A.S.: 64-18-6
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: 101 deg. C (213 deg. F) Vapour Pressure (mmHg): 23
(@ 760 mmHg) (20 deg. C)
Melting Point: 8 deg. C (46 deg. F) Vapour Density (Air=1): 1.6
(@ 760 mmHg)
Specific Gravity: 1.21 Evaporation Rate: 2.1
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): Complete (100%) % Volatiles By Volume: 100
(21 deg. C)
pH: 1.5
Odour Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odour: Colourless liquid. Pungent odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Fire Extinguishing Media: Use water spray, alcohol foam, dry chemical or carbon dioxide.
Flash Point (Closed Cup): 49 deg. C (122 deg. F)
Flammable Limits: Upper - 57 % Lower - 18 %
Autoignition Temperature: 433 deg. C (813 deg. F)
Toxic Gases Produced: Carbon monoxide, carbon dioxide
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards: None identified.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibles: Strong oxidizing agents, strong bases, sulfuric acid
Decomposition Products: Carbon monoxide, carbon dioxide
Conditions To Avoid: Heat, flame, other sources of ignition

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 9 mg/m³ (5 ppm)

Short-Term Exposure Limit (STEL): Not established
 Permissible Exposure Limit (PEL): 9 mg/m³ (5 ppm)

Toxicity Of Components:

Oral Rat LD ₅₀ For Formic Acid	1100 mg/kg
Intraperitoneal Mouse LD ₅₀ For Formic Acid	940 mg/kg
Inhalation-15min Rat LC ₅₀ For Formic Acid	15 g/m ³
Intraperitoneal Mouse LD ₅₀ For Water	190 g/kg
Intravenous Mouse LD ₅₀ For Water	25 g/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation: Severe irritation of respiratory system, coughing, chest pains, nausea, vomiting

Skin Contact: severe irritation or burns

Eye Contact: severe irritation or burns

Skin Absorption: none identified

Ingestion: Irritation and burns to mouth and stomach, nausea, dizziness, unconsciousness

Chronic Effects: None identified

Target Organs: Respiratory System, Skin, Kidneys, Liver, Eyes

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. at concentrations up to 100 ppm, a chemical cartridge respirator with organic vapour cartridge and dust/mist filter is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, neoprene gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area or cabinet.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking, or flames in area. Stop leak if you can do so without risk. Neutralize spill with soda ash or lime. With clean shovel, carefully place material into clean, dry container and cover. Remove from spill area. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**GLYCINE****0041****PRODUCT INFORMATION**

Chemical Name: Glycine

Chinese Name: 甘氨酸

Synonyms: Glycocoll; Aminoacetic Acid

Formula: $\text{NH}_2\text{CH}_2\text{COOH}$

C.A.S.: 56-40-6

RISK SYMBOL

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PHYSICAL DATA

Physical State : Liquid

Boiling Point : Not applicable

Vapour Pressure, mmHg/20 deg. C: Not applicable

City University of Hong Kong

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Melting Point : N/D
Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): 1.595
Water Solubility, %: 217
Appearance And Odour: White crystalline solid.
Evaporation Rate (Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Condition Of Flammability: Nonflammable

Extinguishing Media:

This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Flash Point : Not applicable

Flammable Limits In Air, % Lower: N/D Upper: N/D

Special Fire Fighting Procedures: Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards: Extinguish all nearby sources of ignition.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility: Alkali, oxidizing materials.

Hazardous Decomposition Products:

May liberate carbon monoxide, carbon dioxide, oxides of nitrogen and ammonia.

Conditions To Avoid: None

FIRST AID MEASURES

Primary Routes Of Exposure: Skin or eye contact, inhalation.

Signs And Symptoms Of Exposure:

Inhalation: None currently known.

Eye Contact: Dusts may irritate the eyes.

Skin Contact: Prolonged or repeated contact with the dust may irritate the skin.

Swallowed: None currently known.

Chronic Effects Of Exposure: No specific information available.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: No data found.

Dermal: No data found.

Inhalation: No data found.

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining dust emissions at the point of use.

Respiratory Protection:

If use conditions generate dusts, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles and full face shield. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

This product is intended for use in food, animal feed, drug, or cosmetic manufacture and it has been produced and packaged in accordance with strict quality practices. Maintain this quality level by storing this product away from other chemicals, handling it with care, and avoiding all sources of contamination.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a full facepiece or a half mask air-purifying cartridge respirator with particulate filters. Wear chemical goggles if a half mask is worn. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. keep out of sewers, storm drains, surface waters, and soil. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

City University of Hong Kong

MSDS**HEXANE****0042****PRODUCT INFORMATION**

Chemical Name : Hexane

Chinese Name: 己烷

Synonyms : n-Hexane

Chemical Family : Aliphatic Hydrocarbon

Molecular Formula : C_6H_{14}

Molecular Weight : 86.18

C.A.S : 110-54-3

RISK SYMBOL**PHYSICAL DATA**

Physical State : Liquid

City University of Hong Kong

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Boiling Point, 760mmHg. 68.7 deg. C
Vapour Pressure @ 20 deg. C 124 mmHg
% Volatiles By Volume CA 100
Freezing Point -95.3 deg. C
Vapour Density (Air=1) 3.0
Specific Gravity (H₂O=1) @ 20 deg. C 0.659
Evaporation Rate (Buac=1) Ca 10
Solubility In Water @ 20 deg. C 0.014%
Appearance And Odour : Clear, colourless liquid with a mild hydrocarbon odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable
Extinguishing Media : Carbon dioxide, dry chemical or foam.
Flash Point, (Test Method) -26 deg. C (Tag Closed Cup)
Flammable Limits In Air % By Volume: Lower Limit 1.1 Upper Limit 7.5
Auto Ignition Temperature 225 deg. C
Unusual Fire And Explosion Hazards : Very volatile and extremely flammable.
Special Fire Fighting Procedures :
Water will not be effective in extinguishing a fire and may spread it, but a water spray can be used to cool exposed containers. Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers.

REACTIVITY DATA

Stability : Stable
Hazardous Polymerization : Not expected to occur.
Incompatibility : Strong oxidizing agents.
Hazardous Decomposition Products :
Incomplete combustion can generate carbon monoxide and other toxic vapours.

Conditions To Avoid : Heat, sparks, open flame, open containers, and poor ventilation.

HEALTH HAZARD DATA

Occupational Exposure Limits		Concentration Immediately Dangerous To Health	
OSHA TWA	- 50 ppm	OSHA/NIOSH	5,000 ppm
STEL	- Not Listed		
CEILING	- Not Listed		
Odour Threshold			
ACGIH TLV-TWA	- 50 ppm	NSC	Not listed
TLV-STEL	- Not Listed		
		NIOSH	Not listed
NIOSH 10 hour TWA - 100 ppm			
15 min Ceiling - 510 ppm			

Carcinogenic Data: Hexane is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Primary Routes Of Entry:

Hexane may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: route of exposure/signs and symptoms

Inhalation: Exposure can cause dizziness, numbness of extremities, and intoxication.

Eye Contact: liquid and high vapour concentration can be irritating.

Skin Contact:

Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin.

Ingestion: can cause gastrointestinal tract discomfort.

Effects Of Overexposure:

Hexane is a mild eye and mucous membrane irritant, primary skin irritant, central nervous system depressant and neurotoxin. Acute exposure causes irritation, narcosis, and gastrointestinal tract irritation. Chronic inhalation causes peripheral neuropathy. No systemic toxicity has been reported.

Medical Condition Aggravated By Exposure:

Preclude from exposure those individuals susceptible to dermatitis.

FIRST AID MEASURES

Inhalation:

Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact:

Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact:

Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion: Contact physician immediately. Aspiration hazard - do not induce vomiting.

PREVENTATIVE MEASURES

Ventilation:

Adequate ventilation is required to protect personnel from exposure to chemical vapours exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory:

Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes:

Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin:

Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or nitrile rubber offer acceptable chemical resistance. Individuals who are acutely and specifically sensitive to hexane may require additional protective equipment.

Storage:

Hexane should be protected from temperature extremes and direct sunlight. Proper storage of hexane must be determined based on other materials stored and their hazards and potential incompatibility. In general, hexane should be stored in an acceptably protected and secure flammable liquid storage room.

Other:

Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

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ENVIRONMENTAL PROTECTION DATA

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Spill Control:

Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

Material Safety Data Sheet

City University of Hong Kong

MSDS**HYDROCHLORIC ACID****0043****PRODUCT INFORMATION**

Chemical Name: Hydrochloric Acid

Chinese Name: 氫氯酸

Synonym(s): Aqueous Hydrogen Chloride, Muriatic Acid.

Chemical Family: Inorganic Acid

Molecular Formula: HCl

C.A.S.: 7647-01-0

Product Use:

Acidizing (activation) of petroleum wells; scale removal; ore reduction; metal cleaning; pH adjustment.

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid

Odour And Appearance: Colourless or slightly yellow, fuming liquid with pungent odour.

Odour Threshold: Range 1-35 ppm.

Vapour Pressure: 146 mmHg @ 25 deg. C

Vapour Density: Not available.

Evaporation Rate: Not available.

pH: 0.1 (3.6% W/V, 1N), 1.1 (0.36% W/V, 0.1N)

Boiling Point: 55.5 deg. C

Freezing Point: -25.4 deg. C

Solubility In Water: 100%

Molecular Weight: 36.46

Specific Gravity: 1.18 @ 20 deg. C (Water=1 @ 4 deg. C)

% Volatile By Volume: 100 @ 20 deg. C

Coefficient Of Water/Oil Distribution: Not available.

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Not combustible

Means Of Extinction:

Use water spray to cool containers to prevent rupture and reduce vapour. Do not get water inside containers. Extinguishing agents compatible with hydrochloric acid include dry chemical, carbon dioxide, water spray and foam.

Flash Point: Not combustible (does not burn)

Upper Flammable Limit: Not applicable.

Lower Flammable Limit: Not applicable.

Auto Ignition Temperature: Not applicable.

Hazardous Combustion Products: Hydrogen and chlorine gas form at high temperatures.

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Does not occur.

Incompatibility:

Strong Bases

(Eg. Hydroxides, Carbonates, Amines) Can react violently and release considerable heat.

Metals - Many metals react and release flammable hydrogen gas.

Phosphines

May react violently and may produce toxic, spontaneously flammable phosphine gas.

Acetylides, Borides, Carbides, Silicides

Reaction may be very hot and may yield spontaneously flammable gas.

Vinyl Acetate - May polymerize violently.

Formaldehyde

Reaction with formaldehyde solutions may yield a potent human carcinogen, bis(chloromethyl)ether.

Cyanides, Sulfides - May release toxic gas.

Hazardous Decomposition Products: None

HEALTH HAZARD DATA

Inhalation:

Vapour or mist can cause irritation of the nose, throat, and upper respiratory tract. Symptoms include coughing, choking, and bleeding of the nose and gums. Severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Skin Contact: Causes severe burns if not washed off quickly.

Eye Contact: Causes eye irritation, severe burns, and permanent blindness.

Ingestion:

Causes severe burns of the mouth, esophagus, and stomach with consequent pain, nausea and vomiting, thirst, diarrhea, circulatory collapse and possibly death.

Chronic Exposure Effects:

Inhalation:

Prolonged exposure can cause erosion and discoloration of the teeth and chronic inflammation of the nose, throat and airways.

Skin Contact: Repeated or prolonged contact to dilute solutions can cause dermatitis.

Exposure Limits: Ceiling Exposure Limit (TLV-C):

5 ppm (7 mg/m³) (Hydrogen Chloride - ACGIH)

Mutagenicity: Not available.

Carcinogenicity: Not carcinogenic (IARC and ACGIH)

Sensitization To Product: Not available.

Reproductive Toxicity: Not available.

Names Of Toxicologically Synergistic Products: Not available.

Animal Toxicity Data:

LC₅₀ (Rat): 3,124 ppm/1-Hour Exposure. (100% HCl)

LC₅₀ (Rat, Inhalation Of Mists): 5,666 ppm/30 min. (100% HCl)

LC₅₀ (Mouse, Inhalation Of Mist): 2,142 ppm/30 min. (100% HCl)

LD₅₀ (Rabbit, Oral): 900 mg/kg. (100% HCl)

FIRST AID MEASURES

Inhalation:

Remove source of contamination or move victim to fresh air. If victim is unconscious, do not give anything by mouth. Check breathing and pulse. If breathing has stopped, give victim artificial respiration. If heart is stopped give cardiopulmonary resuscitation (CPR) immediately. If breathing becomes rapid and bubbly, place the person in a sitting position, and give oxygen if possible. Obtain medical attention immediately.

Skin Contact:

As quickly as possible, flush contaminated area with lukewarm gently running water for at least 15 minutes. Under running water, remove contaminated clothing, shoes, and leather goods. Obtain medical attention immediately.

Eye Contact:

Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 20 minutes, holding the eyelid(s) open. Take care not to rinse the contaminated water into the non-affected eye. Obtain medical attention immediately.

Ingestion:

Unless victim is unconscious or convulsing, rinse residual hydrochloric acid from the mouth with water. If victim can swallow, give one cup (250-300 ml) of water or milk to dilute the material in the stomach. Do not induce vomiting. If vomiting occurs naturally, rinse mouth and give water again. Obtain medical attention immediately.

PREVENTATIVE MEASURES

Respiratory Protection:

-Up to 50 ppm: supplied air respirator, self contained breathing apparatus, chemical charge respirator, or a powered air purifying respirator both with cartridge(s) to protect against hydrogen chloride.

-Up to 100 ppm: supplied air respirator operated in a continuous flow mode, full-facepiece supplied air respirator, or full-facepiece self contained breathing apparatus.

Skin Protection:

Impervious gloves, body suits, boots, and/or other resistant protective clothing. An eye-wash and safety shower should be located near any area where hydrochloric acid is handled.

Eye/Face Protection: Chemical safety goggles or face shield for emergency or nonroutine conditions.

Materials For Protective Clothing:

Natural rubber, neoprene, buna-n, polyethylene or PVC (polyvinyl chloride).

Handling Procedures:

When diluting or preparing solutions, slowly add acid to water to avoid boiling and splattering always use in a well ventilated area, preferably with local ventilation.

Storage Requirements:

Store closed containers in a clean, cool, open or well ventilated area, preferably with local ventilation.

Engineering Controls:

Local ventilation is normally required when handling this chemical. Enclosed systems are preferred.

ENVIRONMENTAL PROTECTION DATA

Steps In The Event Of A Spill Or Leak:

Only persons wearing protective equipment should be allowed in areas of leaks. Ventilate area. Vapours evolved from a spill or leak can be knocked down with water fog or spray. Contain spill using absorbent materials. Prevent entry into bodies of water or sewer systems. Absorbent materials which have been tested and recommended for concentrated hydrochloric acid are: anionic polyacrylamide (R 1779), nonionic polyacrylamide (versicol W25), and cellosize WP3H (hydroxyethylcellulose)

Waste Disposal:

Waste hydrochloric acid or acid contaminated water, must never be discharged directly into sewers or surface water. Contaminated material should be neutralized with soda ash (Na_2CO_3), lime (CaO), or limestone (CaCO_3). The residual sludge can be shovelled into containers for disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**HYDROFLUORIC ACID****0044****PRODUCT INFORMATION**

Product Name: Hydrofluoric Acid
Chinese Name: 氫氟酸
Common Synonyms: Hydrogen Fluoride Solution
Chemical Family: Inorganic Acids
Formula: HF
Formula Wt.: 20.01
C.A.S.: 7664-39-3
Product Use: Laboratory reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: 108 deg. C (226 deg. F) Vapour Pressure (mmHg): ~14
(@ 760 mmHg) (20 deg. C)
Melting Point: -35 deg. C (-31 deg. F) Vapour Density (Air=1): 1.97
(@ 760 mmHg)
Specific Gravity: 1.19 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Complete (100%) % Volatiles By Volume: 100
(21 deg. C)
pH: 1.0 (0.1M Solution)
Odour Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odour: Colourless fuming liquid. Acid odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Nonflammable

Fire Extinguishing Media:

Use extinguishing media suitable for surrounding fire. Warning: apply water in flooding quantities from as far a distance as possible in the form of a fog. Do not use a water stream.

Flash Point (Closed Cup): N/A

Flammable Limits: Upper - N/A Lower - N/A

Autoignition Temperature: N/A

Toxic Gases Produced: Hydrogen fluoride, hydrogen

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:

A violent exothermic reaction occurs with water. Sufficient heat may be produced to ignite combustible materials. Reacts with most metals to produce hydrogen gas, which can form an explosive mixture with air.

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Incompatibles:

alkalies, organic materials, most common metals, rubber, leather, fluorine, water, strong bases, carbonates, sulfides, cyanides, oxides of silicon, esp. glass, concrete, silica

Decomposition Products: Hydrogen fluoride, hydrogen

Conditions To Avoid: Moisture

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 2.5 mg/m³ (3 ppm)

TLV (Ceiling) Is For Hydrogen Fluoride.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 2 mg/m³ (3 ppm)

PEL Is For Hydrogen Fluoride.

Toxicity Of Components:

Inhalation-1hr Mouse LC₅₀ For Hydrofluoric Acid

342 ppm

Inhalation-1hr Rat LC₅₀ For Hydrofluoric Acid

1276 ppm

Intraperitoneal Mouse LD₅₀ For Water

190 g/kg

Intravenous Mouse LD₅₀ For Water

25 g/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation:

Irritation of nose and throat, severe irritation or burns of respiratory system, pulmonary edema, lung inflammation

Skin Contact: Severe burns (may be delayed)

Eye Contact: Severe burns (may be delayed)

Skin Absorption: Attacks underlying tissues and bone

Ingestion: Severe burns to mouth, throat, and stomach, kidney disfunction

Chronic Effects: Hypocalcemia, bone and joint damage

Target Organs: Eyes, skin, respiratory system

Medical Conditions Generally Aggravated By Exposure: Pulmonary disease, kidney disorders

Primary Routes Of Entry: Ingestion, inhalation, skin contact, eye contact, absorption

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

For acid burns to the body: 1) remove the victim from the contaminated area and immediately place him under a safety shower or wash him with a water hose, whichever is available. 2) remove all contaminated clothing. 3) keep washing with large amounts of water for a minimum of 15 to 20 minutes. 4) have someone make arrangements for medical attention while you continue flushing the affected area with water. 5) a) if available, after thorough washing, the burned area should be immersed in a solution of 0.2% iced aqueous hyamine 1622## or 0.13% iced aqueous zephiran chloride###. If immersion is not practical, towels should be soaked with one of the above solutions and used as compresses for the burned area. Ideally compresses should be changed every 2 minutes. 5) b) an alternative treatment to 5a is for the physician to inject sterile 10% aqueous calcium gluconate solution subcutaneously beneath, around, and in the burned area. Initially use no more than 0.5 cc per square centimeter and do not distort appearance of skin. If pain is not completely relieved, additional treatment is indicated. 6) seek medical attention as soon as possible for all burns regardless of how minor they may appear initially. ## hyamine 1622 is a trade name for tetracaine benzethonium chloride, merck index monograph 1078, a quaternary ammonium compound sold by rohm & haas, philadelphia. ### zephiran chloride is a trade name for benzalkonium chloride, merck index monograph 1059, also a quaternary ammonium compound, sold by winthrop laboratories, N.Y.C.

Eye Contact:

For acid in the eyes: 1) irrigate eyes for at least 15 minutes with copious quantities of water, keeping eyelids apart and away from eye balls during irrigation. 2) get competent medical attention immediately, preferably an eye specialist. 3) if a physician is not immediately available, apply one or two drops of 0.5% pontocaine hydrochloride# solution followed by a second irrigation for 15 minutes. Use none of the solutions described for skin treatment. Use no oils or greases unless instructed to do so by a physician. # pontocaine hydrochloride is a trade name for tetracaine hydrochloride, merck index monograph 8904, sold by winthrop laboratories, n.y.c.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. at concentrations up to 20 ppm, a chemical cartridge respirator with acid cartridge and dust/mist filter is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, neoprene gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in corrosion-proof area. Store at 38 deg. C or below. Isolate from incompatible materials. Protect from freezing. Material should remain in the original polyethylene container.

Special Precautions:

Hydrofluoric acid is incompatible with glass and all silicon-bearing materials and should never be transferred to glass containers. Material should remain in the original polyethylene container. Unlined steel tanks in hydrofluoric service are subject to indiscriminate hydrogen blistering and should routinely be inspected and repaired.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. stop leak if you can do so without risk. Ventilate area. Neutralize spill with soda ash or lime. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS HYDROGEN PEROXIDE (30-52%) 0045**PRODUCT INFORMATION**

Chemical Name: Hydrogen Peroxide (30-52% Peroxide)

Chinese Name: 雙氧水

Synonyms: Hydrogen Peroxide

Chemical Family : Inorganic Peroxide

Formula: H_2O_2

CAS No.: 7722-84-1

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Boiling Point : A = 222 deg. F; B = 220 deg. F; C = 226 deg. F; D = 237 deg. F

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Vapour Pressure, mmHg/30 deg. C: 18-24
Melting Point : A = -151 deg. F; B = -19 deg. F; C = -27 deg. F; D = -62 deg. F
Vapour Density (Air=1): Not Applicable
Specific Gravity (Water=1): A = 1.112; B = 1.11; C = 1.133; D = 1.196
Water Solubility, %: 100
Appearance And Odour: Clear, colourless liquid; pungent odour
Evaporation Rate (Butyl Acetate=1): >1
Where: A = 30%; B = 31%; C = 35%; D = 50%

FIRE AND EXPLOSION DATA

Condition Of Flammability: Nonflammable
Extinguishing Media: Flood with water.
Flash Point : None
Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

This product may cause a fire if it dries on clothing, wood, or other combustibles. Contact with flammable liquids or vapours may cause immediate fire or explosion, especially if heated, or it may result in a delayed explosion. Decomposition will release oxygen which will increase the explosive limits and burning rate of flammable vapours.

REACTIVITY DATA

Stability: Unstable
Polymerization: Will not occur
Incompatibility:
Reducing agents, combustible materials such as wood, cloth, or organic materials, metals such as iron and copper and their alloys, and dirt. also rust, cyanides, hexavalent chromium compounds, nitric acid, potassium permanganate, and heavy metals and their salts.

Hazardous Decomposition Products:

Releases oxygen gas which, in a confined space, will increase explosive limits and burning rate of flammable vapours. Decomposition will also result in dangerous pressure increases within containers or storage vessels.

Conditions To Avoid: excessive heat and contamination of any kind.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact, inhalation.

Signs And Symptoms Of Exposure:

Inhalation: Vapours and mists severely irritate the nose and throat.

Eye Contact:

Vapours will irritate the eyes. Liquid and mists will irritate and may burn the eyes. This product is corrosive to the eyes and its effects may be delayed. Direct liquid contact on the eyes may cause irreversible damage, including blindness.

Skin Contact:

Brief exposure will irritate the skin. Longer exposure causes irritation, blisters, and burns.

Swallowed:

The liquid is severely irritating to the mouth and throat. Swallowing the liquid may cause a sudden evolution of oxygen, which can cause injury by distension of the esophagus or stomach. Local internal bleeding may result. Swallowing may produce corrosion (burning) of the gastro intestinal tract that maybe life threatening.

Chronic Effects Of Exposure:

Human health effects of overexposure may initially include skin irritation with discomfort or rash, eye irritation with discomfort, tearing or blurring of vision, or irritation of the upper respiratory tract. Higher exposures may lead to eye corrosion with corneal or conjunctival ulceration, skin burns or ulceration, or temporary lung irritation effects with cough, discomfort, difficulty in breathing, or shortness of breath. There are inconclusive or unverified reports of human sensitization.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Rat LD₅₀ = 75 mg/kg (For 75% H₂O₂)

Dermal: Rabbit LD₅₀ = 9200 mg/kg (For 70% H₂O₂)

Inhalation: Rat LC₅₀ > 2000 ppm/8 hr (90% H₂O₂)

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

Other Data:

This product has been reported to be carcinogenic to mouse duodenum when administered at a level of 0.4% in the drinking water continuously over a 108 week lifetime. However, it is improbable that humans will be exposed to such high oral doses due to the acute toxicity of concentrated solutions and the corrosivity of this product to mucous membranes. Accidental human exposure to such high doses is also unlikely since this dose is expected to cause acute toxicity after one exposure. Tests for mutagenic activity in mammalian cell cultures or for fetus effects in animals have been inconclusive, with positive results in some studies and negative results in others. Tests in animals demonstrate no reproductive toxicity.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flood skin with lots of running water for 15 minutes. Remove contaminated clothing and shoes. Get medical attention if irritation persists after flooding. Destroy contaminated clothing and shoes.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

Note To Physician:

Insert a gastric tube to prevent increased pressure that may result from the rapid evolution of oxygen.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the PEL.

Respiratory Protection:

Wear a NIOSH-approved self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator if use conditions generate vapours or mists.

Eye Protection:

Chemical goggles and full faceshield unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing:

Polyester or acrylic full body covering clothing. Nitrile rubber or neoprene boots, apron, and gloves. Do not wear leather shoes or shoes that are cracked, suede, or other porous materials.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry place. Store away from all other chemicals and potential sources of contamination. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Store only in a properly vented container or approved bulk storage facility. Do not block vent in bung cap. Never add any other product to container. Never return unused peroxide to original container.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear polyester or acrylic body-covering clothing and rubber boots, rubber apron, rubber gloves, hard hat with brim, and a self-contained breathing apparatus in the pressure-demand mode. Always wear chemical goggles and a full face shield if a self-contained breathing apparatus is not worn. Extinguish all ignition sources and contain by diking with a non-combustible absorbent. Dilute with lots of water and allow peroxide to decompose. Then pump residue into DOT-approved waste containers or absorb the residue on non-combustible absorbent and place that residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD ACETATE****0051****PRODUCT INFORMATION**

Chemical Name: Lead Acetate

Chinese Name: 乙酸鉛(II)

Common Names/Synonyms:

Lead Acetate (II) Trihydrate; Acetic Acid Lead (II) Salt, Trihydrate

Formula: $C_4H_6O_4Pb_3H_2O$

CAS NO.: 301-04-02

RISK SYMBOL**PHYSICAL DATA**

Boiling Point : 212 deg. F (Decomposes)

Vapor Pressure, mmHg/20 deg. C: Not given

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Melting Point : 167 deg. F
Vapor Density (Air=1): Not given
Specific Gravity (Water=1): 2.55
Water Solubility, %: 60
Appearance And Odor: White crystalline granules; slightly acetic odor
Evaporation Rate (Butyl Acetate=1): Not given

FIRE AND EXPLOSION DATA

Flash Point : Not Flammable Flammable Limits In Air, %
Method Used: N/A Lower: N/A Upper: N/A
Extinguishing Media: Use any medium appropriate for extinguishing surrounding fires.
Special Fire Fighting Procedures: Fire fighters should wear self-contained breathing apparatus.
Unusual Fire And Explosion Hazards:
Extinguish all nearby sources of ignition since vapors decompose to hazardous products. (acetic acid, carbon monoxide and toxic fumes of lead oxide at high temperatures.)

REACTIVITY DATA

Stability: Stable
Polymerization: Will not occur
Conditions To Avoid: Temperatures above 212 deg. F
Materials To Avoid: Bromates, phenol chloral hydrate, sulfides, and acids.
Hazardous Decomposition Products: Lead, lead oxide, acetic acid, carbon monoxide

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact

Signs And Symptoms Of Exposure

Inhalation:

Lead can be absorbed through the respiratory system. local irritation of bronchia and lungs can occur.
Prolonged exposure or repeated exposure can lead to lead poisoning and death. (see swallowing)

Eye Contact:

Dusts will irritate the eyes and prolonged contact may damage the eyes. Absorption of lead can occur through eye tissues.

Skin Contact:

May be absorbed through skin. Symptoms of lead poisoning (see swallowed) may occur. Contact over short periods may cause severe irritation or burns.

Swallowed:

Poison! Early symptoms of lead poisoning are fatigue, disturbance of sleep, constipation. More severe exposures may result in abdominal pain, nausea, headache, loss of appetite, metallic taste in mouth, muscle and joint pain, dizziness and hypertension. Prolonged overexposure can severely damage red blood cell formation, central and peripheral nervous system, kidneys and liver. Resulting high levels of lead in blood may lead to convulsions, coma and death. Soluble lead compounds, such as lead acetate, are the most dangerous. OSHA has reported that lead may impair the reproductive systems of both men and women; damage may also be caused to the unborn fetus.

Chronic Effects Of Exposure:

Lead is a cumulative poison and even exposures to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those for ingestion.

Medical Conditions Generally Aggravated By Exposure:

Persons with pre-existing nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

Oral: Rat TDLO=8524 mg/kg/78weeks (Carcinogenic)

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

Lead acetate is listed as a carcinogen in the NTP third annual report on carcinogens and it is considered an animal carcinogen by the IARC. Lead acetate is not regulated as a carcinogen by OSHA.

Other Data: None

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 15 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the lowest PEL.

Respiratory Protection:

NIOSH-approved dust respirator or mask in the absence of adequate environmental controls at the point of use.

Eye Protection: chemical goggles and full face shield.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry place; well ventilated and away from sources of heat or ignition. Store away from all other chemicals and potential sources of contamination. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapors. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, chemical goggles and approved respirators. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep lead residues out of sewers, storm drains, surface waters and soil. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD NITRATE****0052****PRODUCT INFORMATION**

Chemical Name: Lead Nitrate

Chinese Name: 硝(V)酸鉛(II)

Synonyms: Lead Dinitrate; Nitric Acid, Lead (2+) Salt

Chemical Family: Lead Salt

Formula: $\text{Pb}(\text{NO}_3)_2$

C.A.S.: 10099-74-8

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

Boiling Point : 13601 deg. F (Decomposes)

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Melting Point : 880 deg. F (Decomposes) Vapour Density (Air=1): N/A
Vapour Pressure, mmHg/20 deg. C: N/A
Specific Gravity (Water=1): 4.53 Water Solubility, %: 56.5
Appearance And Odour: White or colourless translucent crystals; odourless
Evaporation Rate (Butyl Acetate=1): N/A

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media: Flood with water.

Flash Point : N/A

Flammable Limits In Air, % Lower: N/A Upper: N/A

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Strong oxidizer. In contact with easily oxidizable substances, it may react rapidly enough to cause ignition, violent combustion, or explosion. increases the flammability of any combustible substance.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility:

Reducing agents, combustible materials such as wood, cloth, or organic materials, metals such as iron and copper and their alloys, and any other oxidizable materials.

Hazardous Decomposition Products: Will liberate toxic oxides of nitrogen.

Conditions To Avoid: High temperatures.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, skin or eye contact.

Signs And Symptoms Of Exposure:

Inhalation:

Lead can be easily absorbed through the respiratory system. Local irritation of bronchia and lungs may occur and in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain and increased lead blood levels may follow. (see swallowing)

Eye Contact: dusts may irritate the eyes.

Skin Contact:

Dusts are extremely corrosive to the skin and rapidly cause severe chemical burns. Moisture on the skin, such as from perspiration, will accelerate tissue destruction. Contact with inorganic lead over short periods may cause local irritation or burns.

Swallowed:

Poison! Early symptoms of lead poisoning are fatigue, disturbance of sleep, constipation. More severe exposures may result in abdominal pain, nausea, headache, loss of appetite, metallic taste in mouth, muscle and joint pain, dizziness and hypertension. Prolonged overexposure can severely damage red blood cell formation, central and peripheral nervous system, kidneys and liver. Resulting high levels of lead in blood may lead to convulsions, coma and death. Soluble lead compounds, such as lead nitrate, are the most dangerous.

Chronic Effects Of Exposure:

Lead is a cumulative poison and exposure to even small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are those for lead poisoning (see swallowing) and restlessness and irritability may also be noted.

Medical Conditions Generally Aggravated By Exposure:

Persons with pre-existing nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

Oral: Guinea Pig LDLO = 500 mg/kg

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining dust emissions at the point of use below the PEL.

Respiratory Protection:

If use conditions generate dusts, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, and gloves.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry place. Do not store on wooden floors! Store away from all other chemicals and potential sources of contamination. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a full facepiece or a half mask air-purifying cartridge respirator with particulate filters. Wear chemical goggles if a half mask is worn. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**MERCURIC CHLORIDE****0054****PRODUCT INFORMATION**

Product Name: Mercuric Chloride

Chinese Name: 氯化汞(II)

Synonyms: Mercury(2)Chloride; Mercury Bichloride; Mercury Perchloric

Chemical Family: Mercuric Salt

Formula: HgCl_2

C.A.S.: 7487-94-7

RISK SYMBOL**PHYSICAL DATA**

Boiling Point : 5761 deg. F

Vapour Pressure, mmHg/20 deg. C: Not applicable

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Melting Point : 531 deg. F
Vapour Density (Air=1): 8.7
Specific Gravity (Water=1): 5.44
Water Solubility, %: 1-10%
Appearance And Odour: White crystal or powder no odour
Evaporation Rate (Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media:

This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Flash Point : Not applicable

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Extinguish all nearby sources of ignition since vapours decompose to hazardous products at high temperatures. Closed containers.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility:

Strong acids, alkalies, carbonates, strong bases, amines and ammonia, most common metals, bromides, antimony, arsenic, sodium, potassium, metallic, salts, albumin, gelatin, tannic acid, formates, sulfites, hypophosphites and phosphates.

Hazardous Decomposition Products: Hydrogen chloride and mercury fumes.

Conditions To Avoid: Heat, sparks, open flames, and out of light.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Swallowed, inhalation, skin or eye contact.

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Signs And Symptoms Of Exposure:

Inhalation:

Breathing dust may irritate the nose and throat and cause coughing and chest discomfort. Fatal if inhaled.

Eye Contact: Dusts will irritate the eyes and prolonged contact may damage the eyes.

Skin Contact:

May be absorbed through skin. Dusts are extremely corrosive to the skin and rapidly cause severe chemical burns. Moisture on the skin, such as from perspiration, will accelerate tissue destruction and may cause burns.

Swallowed: swallowing the dusts or solids may cause nausea and vomiting.

Chronic Effects Of Exposure:

Prolonged or repeated exposure to high concentrations may cause loss of appetite, nose bleeds, and liver, kidney, and neural dysfunction. Fatal if swallowed.

Medical Conditions Generally Aggravated By Exposure:

Pre-existing eye, skin or respiratory disorders may be aggravated.

Oral: (Rat) LD₅₀ = 1 mg/kg

Dermal: (Mouse) LD₅₀ = 5 mg/kg

Inhalation: (Rat) LD₅₀ = 14 mg/kg

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

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FIRST AID MEASURES

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If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 15 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the PEL.

Respiratory Protection:

A respirator is normally not required if this product is used with adequate ventilation.

Eye Protection:

Chemical goggles. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, rubber boots, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags or fibre drums dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped with particulate filters may be satisfactory. In any event, always wear eye protection. for small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHANOL****0057**

PRODUCT INFORMATION

Chemical Name: Methanol

Chinese Name: 甲醇

Synonyms: Methyl Alcohol, Wood Alcohol, Carbinol, Wood Naptha, Methyl Hydroxide

Chemical Family: Alcohol

Formula: CH₃OH

C.A.S.: 67-56-1

RISK SYMBOL



PHYSICAL DATA

Physical State: Liquid

Boiling Point : 148-148.5 deg. F

Vapour Pressure, mmHg/20 deg. C: 96-100

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Melting Point : -144 deg. F
Specific Gravity (Water=1): 0.79
Appearance And Odour: Clear, colourless liquid; mild alcohol odour
Evaporation Rate (Butyl Acetate=1): >2
Vapour Density (Air=1): 1.1
Water Solubility, %: 100

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable

Extinguishing Media:

Use water spray, dry chemical, CO₂, or alcohol foam. Do not use a direct water stream.

Flash Point : 52-53 deg. F

Flammable Limits In Air, % Lower: 6 Upper: 36.5

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility:

Strong oxidizing agents, aluminum, zinc, any metal that displaces hydrogen, acids, and alkalis.

Hazardous Decomposition Products:

May liberate carbon monoxide, carbon dioxide, formaldehyde and unidentified organic compounds in black smoke.

Conditions To Avoid: Heat, sparks, and open flames.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Swallowing, skin or eye contact, inhalation.

Signs And Symptoms Of Exposure:

Inhalation:

Prolonged or repeated exposure or breathing very high concentrations may cause headaches, nausea, vomiting, dizziness, visual disturbances, giddiness, intoxication, sleepiness, unconsciousness, and death. initial symptoms of inhalation may only be mild intoxication but may become more severe after 12-18 hours. Toxic effects are exerted on the central nervous system, especially the optic nerve.

Eye Contact: Vapours will irritate the eyes. Liquid and mists will irritate and may burn the eyes.

Skin Contact:

Brief contact may dry the skin. Prolonged or repeated contact may irritate the skin, causing dermatitis.

Methanol may be absorbed through intact skin to produce systemic effects.

Swallowed:

Swallowing 100-250 ml of methanol can be fatal. Swallowing lesser quantities can cause blindness, dizziness, headaches, or nausea. Absorption of methanol is rapid but excretion is slow, resulting in delayed effects or compounding effects of repeated exposure. Initial symptoms may only be mild intoxication but these may become more severe 12-18 hours later. Toxic effects are exerted on the central nervous system, especially the optic nerve.

Chronic Effects Of Exposure:

Prolonged or repeated exposure may result in CNS damage, blindness, damage to pancreas, or death.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Human LDLO = 340 mg/kg; Rat LD₅₀ = 5628 mg/kg

Dermal: Rabbit LD₅₀ = 20 g/kg

Inhalation: Human TCLO = 86 g/m³ (Irritation); Rat LC₅₀ = 64,000 ppm/4h

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. after patient has vomited have patient drink milk, water, or solution of sodium bicarbonate in water (1 tsp/1 qt). Do not give anything to an unconscious or convulsing person.

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PREVENTATIVE MEASURES

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Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the pel.

Respiratory Protection:

Wear a niosh-approved self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator if use conditions generate vapours or mists.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Handling And Storage Precautions:

Keep away from heat, sparks, and flames. Store in a cool, dry, well-ventilated place away from incompatible materials. Vent container frequently, and more often in warm weather, to relieve pressure. electrically ground all equipment when handling this product and use only non-sparking tools. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. In any event, always wear eye protection. Extinguish all ignition sources and ensure that all handling equipment is electrically grounded. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers.

For large spills, contain by diking with soil or other non-combustible absorbent materials and then pump into DOT-approved waste containers; or absorb with non-combustible sorbent material, place residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

City University of Hong Kong

MSDS**NICKEL CHLORIDE****0060****PRODUCT INFORMATION**

Chemical Name: Nickel Chloride

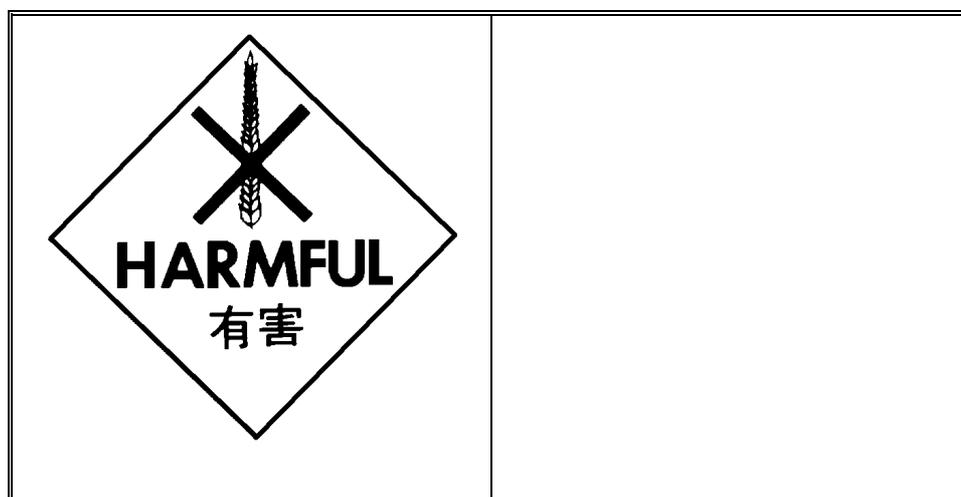
Chinese Name: 氯化鎳(II)

Synonyms: Nickel Chloride Hexahydrate

Chemical Family: Nickel Compound

Formula: $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$

C.A.S.: 7791-20-0

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

Boiling Point: N/A

Vapour Pressure, mmHg/20 deg. C: N/A

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Melting Point: N/A Vapour Density (Air=1): N/A
Specific Gravity (Water=1): 1.57 Water Solubility, %: 100
Appearance And Odour: Green, deliquescent crystals; odourless
Evaporation Rate (Butyl Acetate=1): N/A

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media:

This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Flash Point: Not Flammable

Flammable Limits In Air, % Lower: N/A Upper: N/A

Special Fire Fighting Procedures: None.

Unusual Fire And Explosion Hazards: None.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility: Violent reaction with potassium.

Hazardous Decomposition Products: None

Conditions To Avoid: None

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact

Signs And Symptoms Of Exposure:

Inhalation:

Inhalation causes upper respiratory irritation. Breathing dusts may cause lung damage, including cancer.

Eye Contact: dusts will irritate the eyes.

Skin Contact:

Skin contact causes irritation and sensitization or allergic reactions which may be accentuated by heat and humidity.

Swallowed: Swallowing large quantities may cause nausea, vomiting and giddiness.

Chronic Effects Of Exposure:

Sensitization or allergic reactions and respiratory disorders may result from prolonged exposure to nickel compounds. Insoluble nickel compounds, when inhaled, are suspected by some scientists of contributing to the development of cancer in humans. Soluble nickel compounds, such as nickel chloride, are not considered in the same class. Individuals hypersensitive to nickel may develop asthma, bronchitis, shortness of breath, or wheezing.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Rat LD₅₀ = 105 mg/kg

Dermal: No Data Found

Inhalation: No Data Found

Carcinogenicity:

The IARC and NTP have determined that nickel refining is carcinogenic to humans. However, those agencies cannot specify which nickel compounds are human carcinogens. Some nickel compounds, not including nickel chloride, are animal carcinogens. Osha does not regulate this material as a carcinogen.

Other Data: nickel is considered to be an animal teratogen.

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FIRST AID MEASURES

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If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining dust emissions at the point of use below the PEL.

Respiratory Protection:

Wear a niosh-approved respirator appropriate for the dust concentration at the point of use. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags or fibre drums dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped with particulate filters may be satisfactory. In any event, always wear eye protection. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**NITRIC ACID****0061****PRODUCT INFORMATION**

Chemical Name: Nitric Acid 57-59%

Chinese Name: 硝酸

Synonyms: Aqua Fortis, Engravers Acid, Azotic Acid, Hydrogen Nitrate

Chemical Family: Acids

C.A.S.: 7697-37-2

Molecular Formula: HNO_3

Product Use:

Manufacture of ammonium nitrate for fertilizer and explosives, organic synthesis(dyes, drugs, explosives, cellulose nitrate, nitrate salts), metallurgy, photoengraving, etching steel, ore flotation, urethanes, rubber chemicals, reprocessing spent nuclear fuel.

RISK SYMBOL

PHYSICAL DATA

Physical State: Liquid

Odour And Appearance:

Water white to slightly yellow liquid with a characteristic NO₂ odour. (darkens to brownish colour on aging and exposure to light.

Odour Threshold: Not available

Vapour Pressure: 8@ 20 deg. C.

Vapour Density: (Air=1) 1.58

Evaporation Rate: Low

pH: Less Than 1

Boiling Point: 122 deg. C.

Specific Gravity: 1.42 @ 70.33%

Melting Point: 68+%=Ca-30 deg. F.(-34 deg. C.),100%=-43.6 deg. F.(-41.6 deg. C.)

Solubility In Water: At All %=100%

Molecular Weight: 63.01

% Volatile By Volume: Volatiles @ 122 deg. C. At All %=Ca 100%

Bulk Density: Not available

Coefficient Of Water/Oil Distribution: Not available

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Nonflammable

Means Of Extinguishing:

Use water on fires involving nitric acid to dilute the acid and to absorb liberated oxides of nitrogen.

Flash Point: Nonflammable

Upper Flammable Limit: Not available

Lower Flammable Limit: Not available

Auto Ignition Temperature: Not available

Hazardous Combustion Products:

Nitric acid is nonflammable, however, it is a strong oxidizing agent and can react with combustible materials to cause fires. It can also react with metals to liberate flammable hydrogen gas.

Special Fire Fighting Procedures:

Self-contained breathing apparatus should be used by firefighters in an enclosed area with full protective clothing when nitric acid is involved in the fire.

Explosion Hazards: Not available.

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur.

Incompatibility:

Strong oxidizer and vigorously attacks most metals. May react with many organics to cause a fire or produce toxic NO_x fumes.

Hazardous Reactions/Decompositions:

Nitrogen oxides (NO, NO₂, N₂O, N₂O₃) plus nitric acid mist or vapour.

Conditions To Avoid:

Contact with organic materials such as wood, paper, alcohol, turpentine, hydrogen sulphide, etc, may cause fires. Combustible materials can have an increased flammability after contact with nitric acid.

HEALTH HAZARD DATA

Inhalation:

Inhalation of nitric acid mist or fumes at 2 to 25 ppm, over an 8 hour period, may cause pulmonary irritation and symptoms of lung damage. The onset of symptoms following inhalation may be delayed for several hours. Concentrations over 200 ppm can cause severe pulmonary damage and may be fatal (in 5-10 hours) after several minutes of exposure.

Skin Contact:

This material is corrosive to all body tissues. Skin contact will produce immediate, severe, burns, with a yellow skin discoloration.

Eye Contact: eye contact will produce immediate burns.

Ingestion: ingestion will produce burns of the digestive tract.

Chronic Exposure Effects: Discoloration of teeth

Exposure Limits: TLV-TWA 2ppm, TLV: 5mg/m³, STEL: 10mg/m³

Irritancy: High

Mutagenicity: Not available

Carcinogenicity: This product is not considered a carcinogen.

Sensitization To Product: Not available

Reproductive Toxicity: Not available

Toxicologically Synergistic Materials: Not available

Teratogenicity Data: Not available

Animal Toxicity Data:

Oral-Rat: 0.06 to 0.6 g/kg

Inhalation-Rat:3124 ppm/1 hr.
Other Health Effects: Not available

FIRST AID MEASURES

Inhalation:

Remove victim to fresh air. Administer oxygen, if needed, by authorized personnel. Get medical attention. Observe 4 to 30 hours after exposure for pulmonary edema. Hospitalization may be required.

Skin Contact:

Wash immediately with soap and water. (remove contaminated clothing promptly, under a safety shower for gross contact.) Get medical attention.

Eye Contact: Immediately wash with water for at least 15 min.. Get medical attention.

Ingestion: Give 3 or more glasses of milk or water. Do not induce vomiting. Get medical attention.

PREVENTATIVE MEASURES

Respiratory Protection: Full Face, Cartridge/S.C.B.A.

Skin Protection: Neoprene gloves and body shields should be used where splashing may occur

Eye/Face Protection: safety goggles and full face shield recommended.

Special Handling Procedures:

Nitric acid is a corrosive material and will attack skin, metals and many organic substances. The nitrogen oxides produced from the acid are all toxic, and proper ventilation should always be used. Neutralizing and absorbing materials such as soda ash and sand should be readily available to areas of use and storage of nitric acid. Electrical fixtures to be vapour-proof. Violations are considered serious when concentration are above 4 ppm.

Storage Requirements:

Store in a clean, cool, well-ventilated area, away from organic chemicals, strong bases, metal powders, carbides, sulfides, and any readily oxidizable material. Protect from direct sunlight. Protect against physical damage. (NFPA #43a, code for oxidizer storage.)use tank cars, tank trucks, drums made of stainless steel. Open vent or pressure vacuum.

Engineering Controls: Use exhausting fans; use stainless steel piping and vessels.

Other Precautions:

Safety showers, and eye wash should be readily available. Hoses should be stainless steel wrapped and teflon lined.

ENVIRONMENTAL PROTECTION DATA

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Steps In The Event Of A Leak Or Spill:

Stop discharge. Use water spray to control vapour, contain spill by diking. Pump liquid into an appropriate container.

Environmental Effects: Aquatic Toxicity: 72 mg/l (pH 6.2)/96hr/mosquito fish/ tlm/fresh water

Deactivating Chemicals: Soda ash, sodium bicarbonate, lime.

Waste Disposal Methods:

Contaminated soil may be neutralized with lime. Contact manufacturer and local government authorities.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PERCHLORIC ACID 70%****0062****PRODUCT INFORMATION**

Chemical Name: Perchloric Acid 70%

Chinese Name: 高氯酸

Synonyms: Perchloric Acid

Chemical Family: Inorganic Acid

Formula: HClO_4

C.A.S.: 7601-90-3

RISK SYMBOL**PHYSICAL DATA**Boiling Point: 397 deg. F
Melting Point: -0.4 deg. FVapour Pressure, mmHg/20 deg. C: Unk
Vapour Density (Air=1): Unk

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Specific Gravity (Water=1): 1.67 Water Solubility, %: 100
Appearance And Odour: Colourless to slightly yellow; pungent odour
Evaporation Rate (Butyl Acetate=1): Unk

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-flammable

Extinguishing Media:

This material is not combustible, but combustion is enhanced by other materials. Use water spray or foam.

Flash Point: None

Flammable Limits In Air, % Lower: N/A Upper: N/A

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

May form sensitive powerful explosive mixtures with organic materials. Extinguish all nearby sources of ignition since flammable hydrogen gas will be liberated from contact with some metals. Strong dehydrating agents, such as sulfuric acid, acetic anhydride, or phosphorus pentoxide, may convert the solution to the anhydrous acid which decomposes at ordinary temperatures and explodes upon contact with most organic materials.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility:

Reducing agents, combustible materials such as wood, cloth, or organic materials, metals such as iron and copper and their alloys. Reacts violently with benzene, calcium hydride, charcoal, olefins, ethanol, sulfur and sulfuric acid. Reactions with metals can liberate hydrogen gas. Also avoid acids, oxidizers, alcohols, and de-hydrating agents.

Hazardous Decomposition Products: Will liberate toxic fumes of chlorine

Conditions To Avoid: High temperatures.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact, inhalation.

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Signs And Symptoms Of Exposure:

Inhalation:

Vapours and mists are corrosive to the nose, throat, and mucous membranes. Irritation, coughing, chest pain, and difficulty in breathing may occur with brief exposure while prolonged exposure may result in more severe irritation and tissue damage.

Eye Contact:

Vapours, liquid, and mists are extremely corrosive to the eyes. Brief contact of the vapours will be severely irritating. Brief contact of the liquid or mists will severely damage the eyes and prolonged contact may cause permanent eye injury which may be followed by blindness.

Skin Contact:

Vapours, mists, and liquid are extremely corrosive to the skin. Vapours will severely irritate the skin and liquid and mists will severely burn the skin.

Swallowed:

Vapours, mists, and liquid are extremely corrosive to the mouth and throat. Swallowing the liquid burns the tissues, causes severe abdominal pain, nausea, vomiting, and diarrhea.

Chronic Effects Of Exposure:

Repeated exposure to fumes may cause erosion of teeth. Repeated Exposure to dilute solutions may cause skin rash.

Medical Conditions Generally Aggravated By Exposure:

Persons with pre-existing skin disorders or impaired respiratory function may be more susceptible to the effects of this substance.

Oral: Rat LD₅₀ = 1.1 g/kg; Dog LD₅₀ = 400 mg/kg

Dermal: No data available

Inhalation: No data available

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 15 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing emissions at the point of use. System must be specifically designed for perchloric acid use.

Respiratory Protection:

Wear a niosh-approved respirator appropriate for the vapour or mist concentration at the point of use. Appropriate respirators may be a full facepiece air-purifying cartridge respirator equipped for acid gases/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles and full faceshield unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing:

Acid-resistant slicker suit with rubber apron, rubber boots with pants outside, and rubber gloves with gauntlets.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Handling And Storage Precautions:

Reagent bottle -- maximum 1-pound, glass-stoppered, glass bottle; kept in a heavy glass tray with larger capacity. Additional laboratory storage should be in original bottles inside a glass container padded with glass wool and having greater capacity than the container. Carboys and large bottles should be stored on acid-resisting noncombustible shelves, in a non-combustible structure. All storage must be separated from combustible materials, organic materials, strong dehydrating agents, oxidizing and reducing agents. Perchloric acid must be stored where it will not freeze (freezing point about -4 DEG. F). Protect against physical damage. Electrical wiring, etc., In storage areas must be of watertight type to protect against corrosive action of vapours. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear acid-resistant slicker suit and complete protective equipment including rubber gloves, rubber boots, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full face-piece air-purifying cartridge respirator equipped for acid gases may be satisfactory. In any event, always wear eye protection. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent material and carefully neutralize with soda ash or lime. If soda ash is used, provide adequate ventilation to dissipate the carbon dioxide gas. Keep non-neutralized material out of sewers, storm drains, surface waters, and soil. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PHENOL****0063****PRODUCT INFORMATION**

Chemical Name: Phenol

Chinese Name: 酚 ; 苯酚

Chemical Family: Phenol

Formula: C₆H₅OH

Molecular Weight: 94.11g/Mol

C.A.S.: 108952

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

Appearance And Odour: White/pink solid, colourless liq. Molten; sweet odour; MP 106

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Boiling Point : 358 deg. F
Specific Gravity: 1.1 @ 60 deg. F (H₂O=1)
pH Of Undiluted Product: N.D.
Vapour Pressure: 0.3 @ 25 deg. C mmHg
Viscosity: 3.4 Cst @ 50 deg. C
Percent Voc: 100
Vapour Density: 3.24
Solubility In Water: Moder.

FIRE AND EXPLOSION DATA

Ignition Temp. : 1121 deg. F
Flash Point (Method): 175 deg. F (TCC)
Flammable Limits (%) Lower: 1.5 Upper: 8.6
Recommended Fire Extinguishing Agents And Special Procedures:
According to NFPA guide, use water spray, dry chemical, foam, or carbon dioxide. Water or foam may cause frothing. Use water to cool fire-exposed containers. If a leak or spill has not ignited, use water spray to disperse the vapours and to provide protection for persons attempting to stop the leak.

Unusual Or Explosive Hazards: None

REACTIVITY DATA

Stability: Stable
Hazardous Polymerizations: Will not occur
Incompatibility: Acid chlorides ; acid anhydrides.
Decomposition Products: Carbon monoxide, carbon dioxide, irritating aldehydes and ketones.
Condition To Avoid:

HEALTH HAZARD DATA

Primary Route Of Exposure: Eye skin inhalation
Effects Of Overexposure:
Eyes:
Causes irritation, experienced as pain, with excess blinking and tear Production, and seen as marked excess redness and swelling of the eye And chemical burns of the eye. Severe eye damage may cause blindness.

Skin:

Toxic. Liquid, solid or vapour can be rapidly absorbed through skin. causes weakness, loss of coordination, difficulty walking, drowsiness, convulsions, cyanosis (blue discoloration of skin or lips), and collapse. Symptoms may be delayed. May cause liver and kidney damage. widespread skin contact with liquid may cause death. Liquid or solid can produce severe irritation, with chemical burns and rapid tissue destruction. Prolonged or widespread skin contact may result in the absorption of harmful and potentially fatal amounts of material.

Inhalation:

Vapours are irritating and cause burning of the nose, throat and eyes, coughing, and tightness in the chest. Severe overexposure may result in difficulty breathing, headache, nausea, vomiting, drowsiness, cyanosis (blue discoloration of the skin or lips), loss of coordination, and unconsciousness. Prolonged or severe overexposure may result in pulmonary edema, lung damage, or death. Inhalation of vapours or mist may result in the absorption of potentially harmful amounts of material.

Ingestion:

Causes burning of mouth, throat, and stomach with abdominal and chest pain, nausea, vomiting, diarrhea, thirst, weakness, and collapse. aspiration may occur during swallowing or vomiting, resulting in lung damage.

Sensitization Properties: Unknown.

Chronic:

Prolonged and repeated overexposure may cause damage to liver and kidney; skin contact may cause darkening of skin. Prolonged and repeated overexposure may cause nausea, diarrhea, loss of appetite, weight loss, weakness, headache, dark urine, and muscle pain. Repeated skin contact may cause a persistent irritation or dermatitis.

Medical Conditions Aggravated By Exposure:

Repeated overexposure may aggravate existing liver or kidney disease. skin contact may aggravate an existing dermatitis (skin condition). overexposure to vapour, dust or mist may aggravate existing respiratory conditions, such as asthma, bronchitis, and inflammatory or fibrotic respiratory disease.

Other Remarks:

Phenol poisoning can occur via the lungs and skin, or by swallowing. acute overexposure to phenol causes collapse, convulsions, cyanosis (blue dis-coloration of lips or skin) and coma. Symptoms may be delayed up to several hours. Widespread skin contact can result in rapid onset of symptoms, and death.

Toxicological Information(Animal Toxicity Data)

Median Lethal Dose (LD₅₀ LC₅₀) (Species)

Oral: Animal data does not reflect human toxicity; see sections 3 & 15

Inhalation: Animal data does not reflect human toxicity; see sections 3 & 15

Dermal:

Animal data does not reflect human toxicity; see sections 3 & 15 irritation index, estimation of irritation (species)

Skin: Corrosive

Eyes: Corrosive

Sensitization: N.D.

FIRST AID MEASURES

Ingestion:

If patient is conscious and can swallow, give two glasses of water (16 oz). Do not induce vomiting. Get immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, or cyanosis (blue discoloration of skin or lips) is noted, qualified personnel may administer oxygen. Get immediate medical attention.

Eye Contact:

Immediately flush eyes with large amounts of running water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Get medical attention immediately. Continue flushing with water for an additional 15 minutes if medical attention is not immediately available.

Skin Contact:

Immediately flush skin with large amounts of running water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Destroy non-resistant footwear.

Note To Physician:

Due to the corrosive nature of this material, swallowing may result in severe ulceration, inflammation, and possible perforation of the upper alimentary tract, with haemorrhage and fluid loss. Aspiration of this product during induced emesis can result in severe lung injury. evacuation of stomach contents should be done by means least likely to cause aspiration, such as gastric lavage after endotracheal intubation. contact a poison control centre for additional treatment information. contamination of skin with phenol can result in rapid collapse and death after exposure. After skin contamination, keep patient under observation for at least 24-48 hours. When swallowed, absorption of phenol can be reduced by activated charcoal, followed by careful gastric lavage. Olive or vegetable oils may also be used; do not use mineral oil. Respiratory arrest, ventricular arrhythmias, seizures, methemoglobinemia, metabolic acidosis, and renal failure may occur. Contact a poison control centre for additional treatment information.

Other Instructions:

Phenol-decontaminating fluid containing polyethylene glycol is more effective than water in removing phenol from the skin and retarding absorption; olive oil or vegetable oil may also be used; do not use mineral oil. Alcohols enhance absorption and should not be used. If decontaminating fluids are not immediately available, wipe material away and flush with water. Do not delay treatment.

PREVENTATIVE MEASURES

Eye/Face Protection:

Avoid eye contact. Chemical type goggles with face shield must be worn. do not wear contact lenses.

Skin Protection:

Protective clothing such as uniforms, coveralls or lab coats must be worn. Launder or dry-clean when soiled. Gloves resistant to chemicals and petroleum distillates required. When handling large quantities, impervious suits, gloves, and rubber boots must be worn.

Respiratory Protection:

Airborne concentrations should be kept to lowest levels possible. If vapour, mist or dust is generated, use respirator approved by msha or niosh as appropriate. Supplied air respiratory protection should be used for cleaning large spills or upon entry into tanks, vessels, or other confined spaces. See below for applicable permissible concentrations.

Ventilation: Adequate to meet occupational exposure limits. (see below)

Exposure Limit For Total Product: 5.0 ppm TWA (Skin) (OSHA and ACGIH)

Precautions To Be Taken In Handling And Storage:

Store away from heat and flame. Ground and bond shipping container and unloading line. For low color, store at 115-125 stainless steel or lined containers. Eye wash and safety shower should be available nearby when this product is handled or used.

ENVIRONMENTAL PROTECTION DATA

Procedures In Case Of Accidental Release, Breakage Or Leakage:

Contain spill if possible. Ventilate area. Avoid breathing vapour. Use self-contained breathing apparatus or supplied air mask for large spills and pump to salvage tanks. If material solidifies, melt with water and pump to tankage. Soak up small spills with absorbent material for disposal. Avoid contact with eyes, skin, and clothing.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PHOSPHORIC ACID****0065****PRODUCT INFORMATION**

Chemical Name: Phosphoric Acid

Chinese Name: 磷酸

Synonyms: Phosphoric Acid; Orthophosphoric Acid; Phos Acid.

Chemical Family: Inorganic Acid

Formula: H_3PO_4

C.A.S.: 7664-38-2

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Boiling Point : A=275 deg. F; B=316 deg. F

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Melting Point : A=0 deg. F; B=70 deg. F
Vapour Pressure, mmHg/20 deg. C: A,B <6
Vapour Density (Air=1): 3.4
Specific Gravity (Water=1): A=1.58; B=1.69
Water Solubility, %: 100
Appearance And Odour: Clear, colourless syrupy liquid, no odour
Evaporation Rate (Butyl Acetate=1): Not applicable

A=75% Phosphoric Acid; B=85% Phosphoric Acid

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media:

Use water spray, dry chemical, CO₂, or alcohol foam. Do not use a direct water stream.

Flash Point: None

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Extinguish all nearby sources of ignition since flammable hydrogen gas will be liberated from contact with some metals.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Materials To Avoid:

Alkalis, oxidizing or reducing materials, cyanides, sulfides, combustible materials, active metals, mild steel, copper, brass, and bronze.

Hazardous Decomposition Products: May liberate phosphorous oxides.

Conditions To Avoid: None

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact

Signs And Symptoms Of Exposure:

Inhalation:

Vapours and mists are extremely corrosive to the nose, throat, and mucous membranes. Bronchitis, pulmonary edema, and chemical pneumonitis may occur. Irritation, coughing, chest pain, and difficulty in breathing may occur with brief exposure while prolonged exposure may result in more severe irritation and tissue damage. Breathing high concentrations may result in death.

Eye Contact:

Vapours, liquid, and mists are extremely corrosive to the eyes. Brief contact of the vapours will be severely irritating. Brief contact of the liquid or mists will severely damage the eyes and prolonged contact may cause permanent eye injury which may be followed by blindness.

Skin Contact:

Vapours, mists, and liquid are extremely corrosive to the skin. Vapours will severely irritate the skin and liquid and mists will severely burn the skin. Prolonged liquid contact will burn or destroy surrounding tissue and death may accompany burns which extend over large portions of the body.

Swallowed:

Vapours, mists, and liquid are extremely corrosive to mouth and throat. Swallowing the liquid burns the tissues, causes severe abdominal pain, nausea, vomiting, and collapse. Swallowing large quantities can cause death.

Chronic Effects Of Exposure:

May result in areas of destruction of skin tissue or primary irritant dermatitis. Similarly, inhalation of vapours or mists may cause varying degrees of damage to the affected tissues and also increasing susceptibility to respiratory illness.

Medical Conditions Generally Aggravated By Exposure:

Persons with pre-existing skin disorders, eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of phosphoric acid.

Oral: Rat LD₅₀ = 1,530 mg/kg

Dermal: Rabbit LD₅₀ = 2,740 mg/kg

Inhalation: Human TCLO = 100 mg/m³ (Irritation)

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 30 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 30 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water or milk. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the pel.

Respiratory Protection:

Wear a niosh-approved respirator appropriate for the vapour or mist concentration at the point of use. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator equipped for acid gases/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles and full faceshield unless a full face-piece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing:

Acid-resistant slicker suit with rubber apron, rubber boots with pants outside, and rubber gloves with gauntlets.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a dry, well-ventilated place away from incompatible materials. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Store away from heat and out of direct sunlight maintain a constant temperature of not less than 85 deg. F given this material solidifies at 70 deg. F. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

=====
ENVIRONMENTAL PROTECTION DATA
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Action To Take For Spills Or Leaks:

Wear acid-resistant slicker suit and complete protective equipment including rubber gloves, rubber boots, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full face-piece air-purifying cartridge respirator equipped for acid gases may be satisfactory. In any event, always wear eye protection. Extinguish all ignition sources. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent material and carefully neutralize with soda ash or lime. If soda ash is used, provide adequate ventilation to dissipate the carbon dioxide gas. Keep non-neutralized material out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS

POTASSIUM BROMIDE

0068

PRODUCT INFORMATION

Chemical Name: Potassium Bromide
Chinese Name: 溴化鉀
Synonyms: Potassium Salt Of Bromide
Chemical Family: Potassium Compound
Formula: KBr
C.A.S.: 7758-02-3

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid
Boiling Point: 2516 deg. F

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Melting Point: 1346 deg. F
Vapour Pressure, mmHg/20 deg. C: Not applicable
Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): 2.75
Water Solubility, %: 70
Appearance And Odour: White crystalline solid; odourless
Evaporation Rate (Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media:

This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Flash Point: Not applicable

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire. Contained breathing apparatus.

Unusual Fire And Explosion Hazards: None.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility: Acids, oxidizing materials.

Hazardous Decomposition Products: Will liberate toxic fumes of hydrogen bromide and/or bromine.

Conditions To Avoid: None

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact

Signs And Symptoms Of Exposure:

Inhalation: Breathing dust may irritate the nose and throat and cause coughing and chest discomfort.

Eye Contact: Dusts may irritate the eyes and cause slight transient corneal injury.

Skin Contact:

No irritation is likely after brief contact but may be irritating or cause a burn after prolonged contact with wet or abraded skin.

Swallowed: Low single dose toxicity.

Chronic Effects Of Exposure:

Repeated excessive overexposure may cause nausea, vomiting, muscular weakness, incoordination, depression, psychosis, endocrine effects, depression of the heart, acneform dermatitis. Bromism has been reported in offspring of mothers who also had bromide poisoning as a result of ingestion of bromides during pernancy.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: No data found

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

Other Data: Bromide ion has been shown to interfere with fertility in animal studies.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection:

If use conditions generate dusts, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator. Absence of adequate environmental controls at the point of use.

Eye Protection:

Safety glasses with side shields. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, and gloves.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags or fibre drums dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Containers dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a full facepiece or a half mask air-purifying cartridge respirator with particulate filters. Wear chemical goggles if a half mask is worn. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS

POTASSIUM CYANIDE

0069

PRODUCT INFORMATION

Chemical Name: Potassium Cyanide
Chinese Name: 氰化鉀
Common Names/Synonyms: Cyanide Of Potassium
Chemical Family: Potassium Compound
Formula: KCN
C.A.S.: 151-50-8

RISK SYMBOL



PHYSICAL DATA

Physical State: Solid
Boiling Point: 2,957 deg. F

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Melting Point: 1,174 deg. F
Vapour Pressure, mmHg/20 deg. C: Nil
Vapour Density (Air=1): Not Applicable
Specific Gravity (Water=1): 1.52
Water Solubility, %: 42
Appearance And Odour: White crystalline solid; faint odour of bitter almonds
Evaporation Rate(Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media: Flood with water. Do not use CO₂ which reacts with KCN to produce hcn.

Flash Point: Not Flammable

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire. Potassium cyanide dissolves readily in water, therefore cyanide solution run-off may occur if containers are opened. Run-off should be contained and detoxified with hypochlorite.

Unusual Fire And Explosion Hazards: Hydrogen cyanide gas is flammable and highly toxic.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility:

Reacts violently with strong oxidizers. Large amounts of highly toxic, flammable hydrogen cyanide (hcn) gas will evolve from contact with acids. Water or weak alkaline solution can produce dangerous amounts of hcn in confined areas. Carbon dioxide from the air is sufficiently acidic to liberate hcn gas from cyanide solutions.

Hazardous Decomposition Products: Poisonous HCN and ammonia gases.

Conditions To Avoid: Moisture, heat.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, skin absorption.

Signs And Symptoms Of Exposure:

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Inhalation: Inhalation of dust will cause respiratory tract irritation and may be fatal.

Eye Contact: Dusts will irritate the eyes and prolonged contact may burn and/or damage the eyes.

Skin Contact:

Exposure to the dust will cause irritation. Prolonged or repeated contact may result in an itching rash characterized by macular, popular, and vesicular eruptions. Frequently there is secondary infection. fatal amounts of cyanide can be absorbed through the skin.

Swallowed:

Swallowing the solid can cause death. Cyanides inhibit tissue oxidation causing death through chemical asphyxia.

Chronic Effects Of Exposure:

Exposure to small amounts of cyanide compounds over long periods of time is reported to cause loss of appetite headache, weakness, nausea, dizziness, and symptoms of irritation of the upper respiratory tract and eyes.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Human LDLO = 2.857 mg/kg; Rat LD₅₀ = 10 mg/kg

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

First Aid For Cyanide Exposure :

Actions to be taken in case of cyanide exposure should be planned and practised before beginning work with cyanides (in most cases, cyanide poisoning causes a deceptively healthy pink to red skin color; however, if a physical injury or lack of oxygen is involved, the skin color may be bluish.

Treatment for cyanide poisoning can be provided in two ways, "first aid" and "medical treatment". Both require immediate action to prevent further harm or death. First aid using amyl nitrite and oxygen is generally given by a layman before medical help arrives. Medical treatment involves intravenous injections and must be administered by qualified medical personnel. Even if a doctor or nurse is present, the need for fast treatment dictates using first aid treatment with amyl nitrite and oxygen while medical treatment materials for intravenous injection are being prepared. Experience shows that first aid given promptly is usually the only treatment needed.

Medical treatment is given if the victim does not respond to first aid. it provides a larger quantity of antidote including sodium thiosulfate to chemically destroy cyanide in the body. However, even under

optimum conditions, amyl nitrite can be administered faster and should be used even if medical treatment follows.

Amyl nitrite and medical treatment kits for cyanide poisoning are available, with doctor's prescription, from pharmacies.

First aid -- directions for giving amyl nitrite antidote and oxygen

1. Conscious:

For inhalation and/or absorption if the victim is alert, oxygen may be all that is needed. But if he is not fully conscious or shows signs of poisoning, follow paragraph 2 below. For swallowing, see first aid -- swallowing cyanide.

2. Unconscious But Breathing:

Break an amyl nitrite ampule in a cloth and hold lightly under the victim's nose for 15 seconds, then take away for 15 seconds. Repeat 5-6 times. If necessary, use a fresh ampule every 3 minutes until the victim regains consciousness (usually 1-4 ampules). Give oxygen to aid recovery.

3. Not breathing:

- A. Give artificial respiration, preferably with an oxygen resuscitator. Give amyl nitrite antidote by placing a broken ampule inside the resuscitator face piece, being careful that the ampule does not enter the victim's mouth and cause choking.
- B. If using manual artificial respiration, give amyl nitrite antidote as in paragraph 2 above, except keep the first amyl nitrite ampule under the nose with replacement every 3 minutes.

4. Amyl Nitrite Notes:

- A. Amyl nitrite is highly volatile and flammable; do not smoke or use around source of ignition.
- B. If treating poison victim in a windy or drafty area, provide something -- a rag, shirt, wall, drum, cupped hands, etc. -- to prevent the amyl nitrite vapours from being blown away. Keep the ampule upwind from the nose. The objective is to get amyl nitrite into the victim's lungs.
- C. Rescuers should avoid amyl nitrite inhalation so they won't become dizzy and lose competence.
- D. Do not overuse. Amyl nitrite dilates the blood vessels and lowers blood pressure. While excessive use might put the victim in shock, this has not occurred in practice at manufacturing facilities and DUPONT company is not aware of any death from treatment with amyl nitrite.

If Inhaled:

Remove to fresh air. Lay victim down. Administer amyl nitrite antidote and oxygen. Remove contaminated clothing. Keep patient quiet and warm. call a physician.

In Case Of Eye Contact:

Immediately flush eyes with plenty of water, remove contaminated clothing, and keep victim quiet and warm. Call a physician.

In Case Of Skin Contact:

Wash skin to remove the cyanide while removing all contaminated clothing, including shoes. Do not delay. Skin absorption can occur from cyanide dust, solutions, or hcn vapour. Absorption is slower than

inhalation, usually measured in minutes compared to seconds for inhalation. follow first aid directions for giving amyl nitrite antidote and oxygen (above) if treatment is needed, but even severe skin contact may not require treatment if 1) no inhalation or swallowing has occurred; and 2) the cyanide is promptly washed from the skin and contaminated clothing removed. If skin contact is prolonged, HCN poisoning may occur with nausea, unconsciousness, and then death possible if source of cyanide intake is not removed and treatment provided. Even after washing the skin, the victim should be watched for at least 1-2 hours because absorbed cyanide can continue to work into the bloodstream. wash clothing before reuse and destroy contaminated shoes.

If Swallowed:

Conscious: immediately give patient one pint of 1% sodium thiosulfate solution (or plain water) by mouth and induce vomiting with finger in throat. Repeat until vomit fluid is clear. Never give anything by mouth to an unconscious person. Call a physician.

Unconscious: follow first aid procedure as in paragraphs 2 and 3 above and call a physician. If the victim revives, then proceed with *conscious* paragraph immediately above.

Note To Physician:

Medical treatment is normally provided by a physician, but might be provided by a professionally trained "qualified medical person" where a need exists and where state and local laws permit.

While preparing for sodium nitrite and sodium thiosulfate injections, use amyl nitrite and oxygen as outlined in directions for giving amyl nitrite first aid. When ready and if the victim is not responding to first aid, first inject the solution of sodium nitrite (10 ml of a 8% solution) intravenously at the rate of 2.5 ml/minute, then immediately inject the sodium thiosulfate (50 ml of a 25% solution) at the same rate, taking care to avoid extravasation. this is a fairly lengthy treatment (24 minutes) since a total of 10 + 50, or 60 ml is injected at a rate of 2.5 ml/minute. Consideration should be given to the size and conditions of the victim as treatment is proceeding. It is not essential that full quantities be given just because treatment was started. Injections can be stopped at any point if recovery is evident.

Watch patient continuously for 24 - 48 hours if cyanide exposure was severe. If there is any return of symptoms during this period, repeat this treatment using one-half the amounts of sodium nitrite and sodium thiosulfate solutions. Caution should be used to avoid overuse of medical treatment chemicals as the prescribed dose is about 1/8 the lethal dose for an average individual.

If signs of excessive methemoglobinemia develop (ie, blue skin and mucous membranes, vomiting, shock, and coma), 1% methylene blue solution should be given intravenously. A total dose of 1 to 2 mg/kg of body weight should be administered over a period of five to ten minutes and should be repeated in one hour if necessary. In addition, oxygen inhalation will be helpful. Transfusion of whole fresh blood may be considered if there has been mechanical injury with external or internal bleeding and simultaneous cyanide exposure.

The experience of DUPONT company, a cyanide producer, in treating cyanide poison cases is that first aid procedures using amyl nitrite and oxygen were effective and the only treatment needed in most cases.

medical treatment, using intravenous injections, was used in a few cases. Both procedures have been successful.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining dust emissions at the point of use below the PEL.

Respiratory Protection:

If use conditions generate dusts, wear a niosh-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, rubber boots, rubber gloves, and rubber apron.

Other Protective Measures:

An eyewash and safety shower should be nearby and ready for use. First aid and medical treatment supplies including oxygen resuscitators, should be ready for use by trained personnel.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place. Store away from all other chemicals and potential sources of contamination. Do not store near combustibles or flammables. Do not handle or store food, beverages, or tobacco in cyanide areas. Keep container tightly closed when not in use. do not use pressure to empty container. Wash thoroughly after handling. do not get in eyes, on skin, or on clothing. Do not store near acids or oxidizers.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped with particulate filters may be satisfactory. In any event, always wear eye protection. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM CHROMATE****0070****PRODUCT INFORMATION**

Product Name: Potassium Chromate

Chinese Name: 鉻(VI)酸鉀

Common Synonyms: Chromic Acid, Dipotassium Salt; Bipotassium Chromate

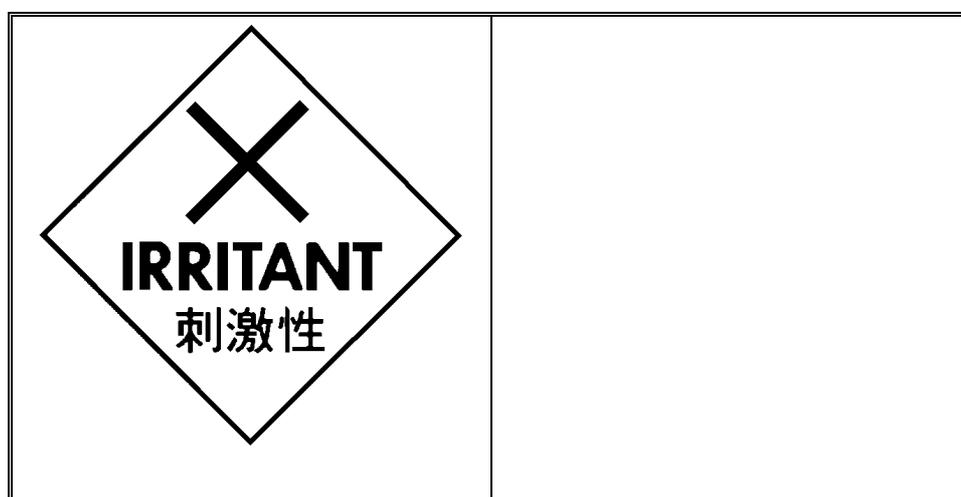
Chemical Family: Chromium Compounds

Formula: K_2CrO_4

Formula Wt.: 194.20

CAS No.: 7789-00-6

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 975 deg. C (1787 deg. F) Vapor Density (Air=1): 6.7
(@ 760 mmHg)
Specific Gravity: 2.73 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Yellow crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards: Moderate oxidizer. Contact with other material may cause fire.
Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Strong reducing agents, combustible materials, organic materials
Decomposition Products: Chromium oxide fumes

HEALTH HAZARD DATA

Inhalation: Excessive inhalation is irritating, may cause respiratory system damage
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: Is harmful and may be fatal.

Ingestion: Is harmful and may be fatal. Gastrointestinal pain
Chronic Effects: Kidney damage, liver damage

Threshold Limit Value (TLV/TWA): 0.05 mg/m³

TLV Is For Chromium (VI) Compounds, Water Soluble, As Cr.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.1 mg/m³

PEL (Ceiling) Is For Chromic Acid And Chromates, As CrO₃.

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: Yes IARC: Yes Z LIST: No OSHA REG: No

Carcinogenicity:

This substance is listed as a NTP human carcinogen and an IARC human carcinogen (group 1).

Reproductive Effects: None identified.

Target Organs: Blood, respiratory system, lungs, liver, kidneys, eyes, skin, gi tract

Medical Conditions Generally Aggravated By Exposure: Damaged skin

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact, absorption

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, if conscious, give large amounts of water. Induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

A respirator with dust/mist filter is recommended. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in secure poison area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) Away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS POTASSIUM HYDROXIDE DRY 0071

PRODUCT INFORMATION

Chemical Name: Potassium Hydroxide
Chinese Name: 氫氧化鉀
Common Names/Synonyms: Caustic Potash Dry
Chemical Family: Alkali
Formula: KOH
C.A.S.: 1310-58-3

RISK SYMBOL



PHYSICAL DATA

Physical State: Solid
Boiling Point : 2500 deg. F

Melting Point : 715 deg. F
Vapour Pressure, mmHg/20 deg. C: 40-50 @ 1000 deg. C.
Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): 2.044
Water Solubility, %: 52.8
Appearance And Odour: White hygroscopic flake or pellet, no odour
Evaporation Rate (Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable

Extinguishing Media:

This material is not combustible. Contact with water may generate enough heat to ignite combustible materials.

Flash Point : None

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

This material melts at 715 DEG. F. Hot molten material will react violently with water resulting in spattering and fuming. In the molten state this product will react with metals such as aluminum, tin, or zinc to produce flammable hydrogen gas.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility:

Acids, combustible materials, and metals such as aluminum, tin, galvanized zinc, brass, and bronze. Avoid contact with trichloroethylene to prevent spontaneous formation of flammable dichloroacetylene.

Hazardous Decomposition Products: None

Conditions To Avoid:

Keep water and moist air out of the container. Do not allow contact with acids and reactive metals.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact

Signs And Symptoms Of Exposure:

Inhalation:

Dusts are extremely corrosive to the entire respiratory tract. Breathing dust can destroy the mucous membranes and can cause severe pneumonitis.

Eye Contact:

Dusts are extremely corrosive to the eyes. Brief contact causes severe eye damage and prolonged contact causes permanent eye injury which may be followed by blindness.

Skin Contact:

Dusts are extremely corrosive to the skin and rapidly cause severe chemical burns. Moisture on the skin, such as from perspiration, will accelerate tissue destruction.

Swallowed:

Dusts or solids are extremely corrosive to the mouth and throat. swallowing dusts or solids causes severe and rapid burning of the mouth, throat, and digestive tract accompanied by severe pain, vomiting and collapse. Some effects may be delayed.

Chronic Effects Of Exposure:

May result in areas of destruction of skin tissue or primary irritant dermatitis. Similarly, inhalation of dusts, vapours, or mists may cause varying degrees of damage to the affected tissues and also increasing susceptibility to respiratory illness.

Medical Conditions Generally Aggravated By Exposure: None known.

Oral: No data found for solid caustic potash but 45% liquid rat LD₅₀=205 mg/kg

Dermal:

No Data Found For Solid Caustic Potash But 45% Liquid Rabbit
LD₅₀=1260 mg/kg

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

Other Data:

5 mg/24hr produced moderate irritation to rabbit skin. 1 mg/24hr produced moderate irritation to rabbit eye.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 30 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention. Speed is essential.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 30 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water or milk. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection:

NIOSH-approved dust respirator or mask in the absence of adequate environmental controls at the point of use.

Eye Protection: Chemical goggles and full face shield.

Protective Clothing:

Alkali-resistant slicker suit with rubber apron, rubber boots with pants outside, and rubber gloves with gauntlets.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry place. Keep container tightly close when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full. This material generates considerable heat when dissolved in water. When mixing with water always add caustic potash slowly to water and stir continuously. Never add water to caustic potash.

Other Precautions:

This product is intended for use in food, animal feed, drug, or cosmetic manufacture and it has been produced and packaged in accordance with strict quality practices. Maintain this quality level by storing this product away from other chemicals, handling it with care, and avoiding all sources of contamination.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and chemical goggles. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM IODATE****0072****PRODUCT INFORMATION**

Chemical Name: Potassium Iodate

Chinese Name: 碘酸鉀

Common Synonyms: Iodic Acid, Potassium Salt

Chemical Family: Potassium Compound

Formula: KIO_3

C.A.S.: 7758-05-6

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

Boiling Point :

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Melting Point : 1040 deg. F
Vapour Pressure, mmHg/20 deg. C: Not applicable
Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): 3.9
Water Solubility, %: 89
Appearance And Odour: White crystals; odourless
Evaporation Rate (Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media:

This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Flash Point : Not Applicable

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

May explode when exposed to mechanical shock or friction or upon contact with combustible materials. Upon heating oxygen may be released which, if confined, can increase the explosive limit or burning rate of flammable vapours or combustible materials.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility:

Acids, reducing agents, combustible materials such as wood, cloth, or organic materials, metals such as iron, aluminum, copper and their alloys, hydrogen peroxides, sulfides and any other oxidizable materials.

Hazardous Decomposition Products:

Will liberate toxic fumes of oxides of potassium and iodide and corrosive HI.

Conditions To Avoid: Excessive heat and contamination of any kind.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact, inhalation.

Signs And Symptoms Of Exposure:

Inhalation:

Breathing dust may irritate the nose , throat, and respiratory tract and cause coughing, chest discomfort and shortness of breath.

Eye Contact: Dusts may irritate the eyes.

Skin Contact:

Prolonged or repeated contact with the dust may irritate the skin, especially if skin is moist.

Swallowed:

Swallowing the dusts or solids may cause gastrointestinal irritation with resulting abdominal pain, diarrhea, nausea and vomiting. Animal experiments suggest a potential for kidney and blood cell damage.

Chronic Effects Of Exposure:

Repeated ingestions may cause kidney dys-function or failure and blood conditions such as hemolysis. The central nervous system may be affected.

Medical Conditions Generally Aggravated By Exposure:

Persons with impaired liver or kidney function may be more susceptible to the effects of this substance.

Oral: Mouse LDLO = 531 mg/kg

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection:

If use conditions generate dusts, wear a niosh-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator. Absence of adequate environmental controls at the point of use.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well ventilated place. Store away from all other chemicals and potential sources of contamination. Do not store on wooden floors. Protect from heat, shock, and physical damage. Keep container tightly closed when not in use. Wash hands thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a full facepiece or a half mask air-purifying cartridge respirator with particulate filters. Wear chemical goggles if a half mask is worn. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM IODIDE****0073****PRODUCT INFORMATION**

Chemical Name: Potassium Iodide

Chinese Name: 碘化鉀

Common Synonyms: Iodic Acid, Potassium Salt.

Chemical Family: Potassium Compound

Formula: KI

C.A.S.: 7681-11-0

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Boiling Point: 2588 deg. F

Vapour Pressure, mmHg/20 deg. C: 1

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Melting Point: 1333 deg. F Vapour Density (Air=1): N/D
Specific Gravity (Water=1): 3.1 Water Solubility, %: 140 g/100g
Appearance And Odour: White odourless granules or crystals.
Evaporation Rate (Butyl Acetate=1): N/D

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media: Use water spray, dry chemical, CO₂, or alcohol foam.

Flash Point: N/A

Flammable Limits In Air, % Lower: N/A Upper: N/A

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards: None.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility: Acids, oxidizing materials, bromine trifluoride and trichloride

Hazardous Decomposition Products: Iodine, oxides.

Conditions To Avoid: None

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, skin or eye contact, swallowed.

Signs And Symptoms Of Exposure:

Inhalation: Breathing dust may irritate the nose and throat and cause coughing and chest discomfort.

Eye Contact: Dusts may irritate the eyes.

Skin Contact: No irritation is likely after brief contact but may be irritating after prolonged contact.

Swallowed: None currently known.

Chronic Effects Of Exposure:

May produce "iodism" which may be manifested by skin rash, running nose, headache and irritation of mucous membrane. Weakness, anemia, loss of weight and general depression may also occur.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: No data found.

Dermal: No data found.

Inhalation: No data found.

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining dust emissions at the point of use below the PEL.

Respiratory Protection:

If use conditions generate dusts, wear a niosh-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles and full face shield. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags or fibre drums dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped with particulate filters may be satisfactory. In any event, always wear eye protection. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS POTASSIUM PERMANGANATE 0074

PRODUCT INFORMATION

Chemical Name: Potassium Permanganate
Chinese Name: 高錳酸鉀
Synonyms(S): Permanganic Acid, Potassium Salt.
Chemical Family: Not Applicable
Molecular Formula: KMnO_4
Product Use: Water Treatment, Metallurgy
CAS Registry Number: 7722-64-7

RISK SYMBOL



PHYSICAL DATA

Physical State: Crystals

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Odour And Appearance: Dark purple to bronze crystals with no odour.

Odour Threshold: Odourless.

Specific Gravity: (H₂O=1) 2.70

Bulk Density: Not applicable

Vapour Pressure: Not applicable

Boiling Point: Not applicable

Vapour Density: (Air=1) Not applicable

% Volatiles By Volume: 0

Evaporation Rate: (Butyl Acetate=1) Not applicable

Solubility In Water: Moderate 1-10%

Melting Point: Decomposes @ 150 deg. C (302 deg. F)

pH: Not applicable

Coefficient Of Water/Oil Distribution: Not applicable

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Not applicable

Means Of Extinction: Water spray.

Flash Point And Method Of Determination: Not applicable

Upper Flammable Limit: Not applicable

Lower Flammable Limit: Not applicable

Auto Ignition Temperature: Not applicable

Special Fire Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Fire And Explosion Hazards: Strong oxidizer. contact with other material may cause fire.

REACTIVITY DATA

Stability: Stable

Incompatibility:

Organic materials, combustible materials strong reducing agents, strong acids, peroxides, alcohols, chemically active metals.

Hazardous Reactions/Decompositions: Not applicable

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Chronic And Acute Effects On Route Of Entry:

Inhalation:

Excessive inhalation of dust is irritating and may be severely damaging to respiratory passages and/or lungs. Prolonged inhalation of manganese in the form of its inorganic compounds may cause manganism.

Eye Contact: May cause severe irritation or burns.

Skin Contact:

Prolonged contact with solutions may be irritating leaving brown stains. Concentrated solutions may cause burns. Crystals are corrosive to skin.

Ingestion:

Ingestion may cause nausea, vomiting, gastrointestinal irritation, and burns to mouth and throat.

Exposure Limits:

TLV = 5 mg/m³(ACGIH TLV FOR MANGANESE DUST EXPRESSED AS Mn)

Irritancy: Causes irritation

Mutagenicity: Not available

Sensitization To Product: No data

Animal Toxicity Data: LD₅₀ (Oral-Rat) (mg/kg) - 1090

LD₅₀ (Scu-Mouse) (mg/kg) - 500

Carcinogenicity: IARC, NTP, and OSHA Non Carcinogenic

Reproductive Toxicity: No data

Teratogenicity Data: Not available

Name Of Toxicologically Synergistic Products: No data

FIRST AID MEASURES

Inhalation: Remove to fresh air. If not breathing give a.r. if breathing is difficult give oxygen.

Eye Contact: Flush eyes with plenty of water for 15 minutes.

Skin Contact: Flush skin with plenty of water for 15 minutes.

Ingestion:

Do not induce vomiting, if conscious, give large amounts of water. Follow with diluted vinegar, fruit juice or whites of eggs, beaten with water.

PREVENTATIVE MEASURES

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator such as NIOSH/MSHA TC-21C-287 is recommended. If concentration exceeds capacity of respirator, self-contained breathing apparatus is advised.

Eye/Face Protection: Safety glasses with sideshields are advised.

Skin Protection: Normal work clothing covering arms and legs. Butyl rubber gloves are recommended.

Respiratory Controls:

Use general or local exhaust ventilation to meet TLV requirements. Materials for protective clothing: butyl rubber gloves.

Precautions:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

Storage Requirements: Store separately and away from flammable and combustible materials.

Handling Procedures:

Keep combustibles (wood, paper, oil, etc.) away from spilled area in tightly closed container. Wash thoroughly after handling.

ENVIRONMENTAL PROTECTION DATA

Procedures To Be Followed In Case Of A Leak Or Spill:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Environmental Effects: Not available

Deactivating Chemicals: Not available

Material Safety Data Sheet

City University of Hong Kong

MSDS POTASSIUM SODIUM TARTRATE, 0075
4-HYDRATE

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PRODUCT INFORMATION

Chemical Name: Potassium Sodium Tartrate, 4-Hydrate

Chinese Name: 酒石酸鈉鉀

Common Synonyms: Rochelle Salt

Chemical Family: Potassium Compounds

Formula: $\text{KOCO}(\text{CHOH})_2\text{COONa} \cdot 4\text{H}_2\text{O}$

Formula Wt.: 282.22

C.A.S.: 6381-59-5

Product Use: Laboratory Reagent

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RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Boiling Point: N/A

Vapour Pressure (mmHg): N/A

Melting Point: 70 deg. C (158 deg. F)
(@ 760 mmHg)

Vapour Density (Air=1): N/A

Specific Gravity: 1.79
(H₂O=1)

Evaporation Rate: N/A

Solubility(H₂O): Appreciable (>10%)

% Volatiles By Volume: 0

(21 deg. C)

pH: N/A

Odour Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odour: White crystals. odourless.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Flash Point (Closed Cup): N/A

Flammable Limits: Upper - N/A Lower - N/A

Autoignition Temperature: N/A

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.

Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Incompatibles: Metallic salts, mineral acids, strong oxidizing agents

Decomposition Products: Carbon monoxide, carbon dioxide

Conditions To Avoid: Heat

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No
Carcinogenicity: None identified.
Reproductive Effects: None identified.
Effects Of Overexposure:
Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM THIOCYANATE****0076****PRODUCT INFORMATION**

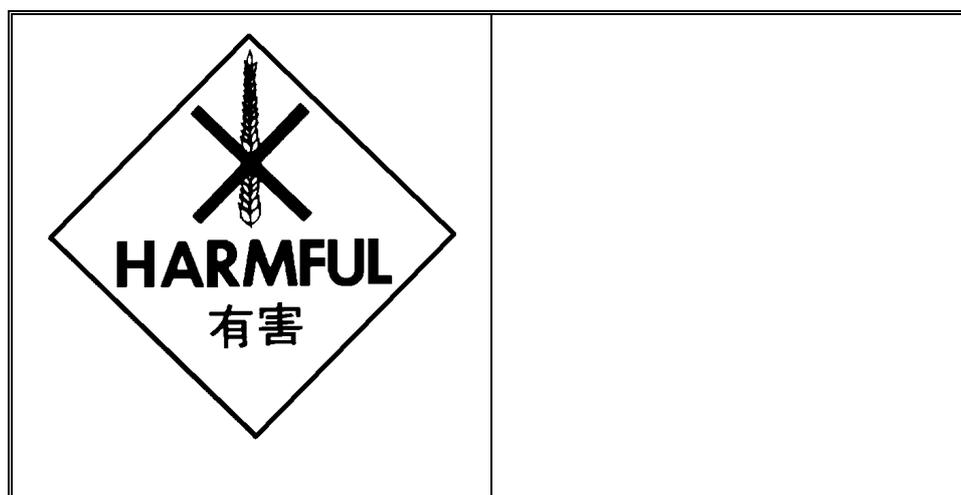
Product Name: Potassium Thiocyanate

Chinese Name: 硫氰酸鉀, 硫氰化鉀

Common Synonyms: Thiocyanic And Potassium Salt; Potassium Isothiocyanate

Formula: KSCN

C.A.S.: 333-20-0

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

Boiling Point: 932 deg. F

Melting Point: 343 deg. F

Vapour Pressure, mmHg/20 deg. C: N/A

Vapour Density (Air=1): N/A

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Specific Gravity (Water=1): 1.89 Water Solubility, %: >10
Appearance And Odour: White odourless crystals
Evaporation Rate (Butyl Acetate=1): N/A

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media:

This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Flash Point: N/A

Flammable Limits In Air, % Lower: N/D Upper: N/D

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards: None.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility: Nitric acid, strong oxidizers, active halogen compounds.

Hazardous Decomposition Products: Hydrogen cyanide, oxides of sulfur and nitrogen.

Conditions To Avoid: None.

HEALTH HAZARD DATA

Primary Routes Of Exposure: None indicated.

Signs And Symptoms Of Exposure:

Inhalation: None currently known.

Eye Contact: None currently known.

Skin Contact: Contact may cause ulcers, local discoloration, eczema.

Swallowed: None currently known.

Chronic Effects Of Exposure: No specific information available.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: rat LD₅₀ = 854 mg/kg

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection: None required.

Eye Protection:

Safety glasses with side shields. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a dry, well-ventilated place away from incompatible materials. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

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ENVIRONMENTAL PROTECTION DATA
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Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a full facepiece or a half mask air-purifying cartridge respirator with particulate filters. Wear chemical goggles if a half mask is worn. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PROPANOL-1****0077****PRODUCT INFORMATION**

Chemical Name: N-Propanol

Chinese Name: 丙-1-醇

Synonyms: 1-Propanol; N-Propyl Alcohol; Ethylcarbinol

Chemical Family: Alcohols

Formula: C₃H₇OH

Molecular Weight: 60.10

C.A.S.: 71-23-8

Use: All-purpose solvent.

RISK SYMBOL**PHYSICAL DATA**

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Physical State: Liquid
Boiling Point, @ 760 mmHg 97.2 deg. C
Freezing Point -126.2 deg. C
Specific Gravity (H₂O = 1) 0.8045 @ 20/20 deg. C
Vapour Pressure @ 20 deg. C 14.9 mmHg
Vapour Density (Air = 1) 2.1
Solubility In Water, % By Weight 100
% Volatiles By Volume 100
Evaporation Rate (Butyl Acetate = 1) 1.3
Appearance And Odour: Water-white liquid; mild and nonresidual odour.

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable

Extinguishing Media:

Use alcohol-type or all-purpose-type foam by manufacturers' recommended techniques for large fires.
Use carbon dioxide or dry chemical media for small fires.

Flash Point: 24 deg. C, Tag Closed Cup, ASTM D 56.
27 deg. C, Tag Open Cup, ASTM D 1310.

Flammable Limits In Air, % By Volume Upper: 13.7% Lower: 2.1%

Special Fire Fighting Procedures:

Use water spray to cool fire-exposed containers and structures, and to disperse vapours; reignition is possible. Use self-contained breathing apparatus and protective clothing.

Unusual Fire And Explosion Hazards:

Vapours form from this product and may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges, or other ignition sources at locations distant from product handling point. This material may produce a floating fire hazard.

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Incompatibility:

Avoid concentrated nitric and sulfuric acids, strong oxidizers, aldehydes, halogens, and halogen compounds.

Hazardous Combustion Or Decomposition Products:

Burning may produce carbon monoxide and/or carbon dioxide.

Conditions To Avoid: Heat, fire, and ignition sources.

HEALTH HAZARD DATA

Exposure Limits: 200 ppm	TWA-Skin	ACGIH (1989-90)
250 ppm	STEL-Skin	ACGIH (1989-90)
LC ₅₀ : 48 g/m ³	Inh.-Mouse	RTECS (1989)
LD ₅₀ : 1870 mg/kg	Oral-Rat	RTECS (1989)
5040 mg/kg	Skin-Rabbit	RTECS (1989)

Swallowing:

Moderately toxic. May cause nausea, vomiting, diarrhea, abdominal discomfort, drowsiness, and unconsciousness.

Skin Absorption: No evidence of adverse effects from available information.

Inhalation:

Vapours are irritating to the eyes and respiratory tract. High concentrations may cause headache, dizziness, drowsiness, narcosis, and unconsciousness.

Skin Contact:

Brief contact is not irritating. Prolonged contact, as from clothing wet with the material, may cause drying and cracking of the skin due to a defatting action.

Eye Contact:

Causes a stinging sensation and irritation, seen as excess redness and swelling of the conjunctiva.

Effects Of Repeated Overexposure:

The injury produced upon repeated administration is generally associated with the liver.

Medical Conditions Aggravated By Overexposure:

Because of its defatting properties, this material may aggravate an existing dermatitis. Breathing of vapours and/or mist may aggravate asthma and inflammatory or fibrotic pulmonary disease.

FIRST AID MEASURES

Swallowing: Give two glasses of water and induce vomiting. Call a physician.

Skin: Remove contaminated clothing and flush skin with water. Wash clothing before reuse.

Inhalation:

Remove to fresh air. Give artificial respiration if not breathing. Oxygen may be given by qualified personnel if breathing is difficult. Call a physician.

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes. seek medical attention.

Notes To Physician:

There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

PREVENTATIVE MEASURES

Respiratory Protection:

Niosh or msha approved self-contained breathing apparatus in high vapour concentrations.

Ventilation:

This product should be confined within covered equipment, in which case general (mechanical) room ventilation should be satisfactory. Special local ventilation may be needed at points where vapours can be expected to escape to the workplace air.

Protective Gloves: Nitrile, butyl, or PVC-coated

Eye Protection: Monogoggles

ENVIRONMENTAL PROTECTION DATA

Spill:

Extinguish and do not turn on any ignition source until the area is determined to be free from explosion or fire hazards. Wear suitable protective equipment. Small spills could be flushed with large quantities of water. Larger spills should be collected for disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**2-PROPANOL****0078****PRODUCT INFORMATION**

Chemical Name: 2-Propanol

Chinese Name: 丙-2-醇

Synonym: Isopropanol (Isopropyl Alcohol, IPA)

Formula: $(\text{CH}_3)_2\text{CHOH}$

CAS No: 67-63-0

Product Use:

In antifreeze compositions; in cosmetics; in quick-drying oils and inks; in extraction processes; as a solvent for gums, shellac, essential oils; solvent in the electronic industry.

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Appearance And Color: Colourless liquid. slight odour, resembling a mixture of acetone and ethanol.
Odour Threshold: 28.2 ppm
Boiling Point: 82.3 deg. C
Freezing Point:
(Melting Point): -88.5 deg. C
Solubility In Water: Complete
Evaporation Rate (Ether = 1.0): 7.7
Slow <0.3 Fast >3.0
Medium 0.3-3.0
Specific Gravity (H₂O=1): 0.785
pH: Neutral
% Volatiles By Volume:(@ 20 deg. C) 100
Vapour Density (Air=1): 2.1
Vapour Pressure:(mmHg @ 20 deg. C) (PSIG) 33
Molecular Weight: 60.10
Coefficient Of Water/Oil Distribution: Not available

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Flammable
Flash Point: 11.7 deg. C
% By Vol. In Air Upper Flammable Limit: 12 Lower Flammable Limit: 2
Auto Ignition Temperature: 455 deg. C
Hazardous Combustion Products: Carbon monoxide, carbon dioxide.
Explosion Hazards: A moderate explosion hazard when exposed to flames or heat.
Fire Extinguishing Procedures:
Use dry chemical, "alcohol" foam or CO₂. Water may be ineffective but water spray may reduce vapours and cool containers exposed to fire.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: High temperatures
Incompatibility :
Acetaldehyde, chlorine, ethylene oxide, combination of hydrogen-palladium particles, oleum, hypochlorous acid, isocyanates, nitroform, perchloric acid, hydrogen peroxide-sulfuric acid, hydrochloric, ammonium hydroxide combinations - strong oxidants in general.

Hazardous Decomposition Products:
No studies available, but carbon monoxide, carbon dioxide and possibly aldehydes would be expected.

HEALTH HAZARD DATA

Inhalation:

Isopropyl alcohol is about twice as toxic as ethyl alcohol and produces similar symptoms of intoxication. Gross overexposure can produce severe central nervous system depression, coma and possibly fatal respiratory failure. TCLO (human): 400 ppm, symptom; irritation of mucous membranes.

Ingestion:

The probable lethal dose in an adult is about 240 ml but as little as 20 ml may produce symptoms. Findings may include severe nausea, vomiting, abdominal pain, bleeding and central nervous system depression. Pulmonary damage including tracheo-bronchitis, bronchopneumonia and haemorrhagic pulmonary edema may occur as result of pulmonary excretion of the alcohol. Other problems that may occur include a fall in hemoglobin levels due to hemolysis and a reduction in blood sugar levels.

Skin:

Isopropyl alcohol does not seem to be significantly absorbed through the skin but the limited absorption may add to the effect of inhalation. repeated exposures to the skin may result in dermatitis resulting from a defatting action.

Eyes:

Isopropyl alcohol vapours at 800 ppm are irritating to humans within 3-5 minutes. Contact with liquid alcohol produces intense stinging and burning sensations. With prolonged contact to the liquid, temporary damage to the membranous tissue covering the cornea has been reported, but healing has been prompt.

Acute Toxicity:

Moderate Toxicity

LDLO (Oral, Man): 8600 mg/kg

LD₅₀ (Oral, Rat): 5045 mg/kg (Depressed Activity)

Chronic Toxicity:

Overexposure (above limits) will result in toxic effects noted above. tests on rats, at relatively high doses had moderate effects on fertility.

Exposure Limits:

TLV: 980 mg/m³

STEL: 1225 mg/m³

Biological Exposure Indices (BEI):

Action Level

Proposed: 100 mg/l in urine or blood, upper limit (sampled at end of workaday.)

FIRST AID MEASURES

Inhalation:

Remove to fresh air; if breathing is difficult, give oxygen if qualified personnel are available. Get medical attention.

Ingestion:

If conscious and alert, give large quantities of water and induce vomiting by touching back of throat with finger. Never give anything by mouth to a person who is unconscious. Get medical attention.

Skin:

Wash thoroughly with water and promptly remove contaminated clothing. Wash clothing before reuse.

Eyes: Flush with water for at least 15 minutes. If irritation persists, get medical evaluation.

PREVENTATIVE MEASURES

Respiratory Protection:

None usually required if handling is in closed ventilation system mentioned below. Otherwise, use niosh-approved organic vapour cartridge respirator. In the event of a spill or emergency, use self-contained, niosh-approved breathing apparatus.

Eyes And Face:

Wear chemical goggles if there is reasonable probability of exposure to liquid or mist. Do not wear contact lenses in this case.

Hands, Arms, And Body:

Protective gloves and protective clothing (neoprene) if there is repeated or prolonged exposure to liquid or mist. Otherwise, full work clothing. Remove immediately any wet contaminated clothing.

Storage:

Protect from physical damage. Store in a cool, dry well-ventilated area away from ignition sources and other fire hazards. Do not store with incompatible materials. No smoking in storage areas.

Normal Handling:

Keep away from heat, open flame or other high temperature sources. Avoid contact with skin, eyes and clothing; avoid breathing vapour or mist. Use good personal hygiene and housekeeping practices.

Engineering Controls:

Provide complete ventilated enclosure of material eg. An exhausted hood of explosion-proof construction. Isopropanol corrodes many types of rubber. Use neoprene where required. Provide eyewash and quick drench shower facilities.

ENVIRONMENTAL PROTECTION DATA

Spill Or Leak (Always Wear Personal Protective Equipment):

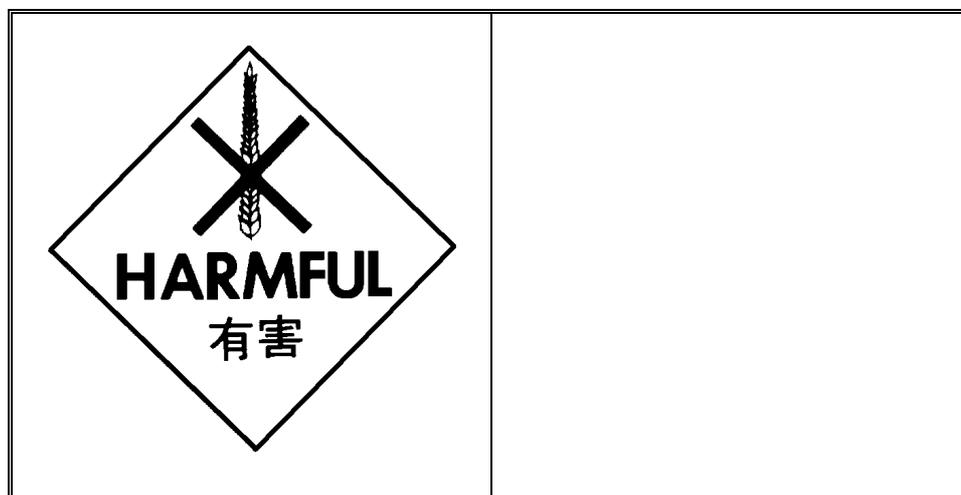
Remove personnel from the area. Remove all sources of ignition. Remove leaky sources to the outside if possible. Small spills: mop up, wipe up, or soak up immediately. Place soaked wiping material in a metal container and seal. Large spills: use water spray to disperse vapours and protect any persons attempting to stop a leak, as well as to flush spills away from fire hazard exposures. If possible, dike up. Use water to dilute spills to non-flammable mixtures.

Material Safety Data Sheet

City University of Hong Kong

MSDS**RESORCINOL****0079****PRODUCT INFORMATION**

Chemical Name: Resorcinol
Chinese Name: 雷瑣酚, 間苯二酚
Synonyms: Resorcinol, 1,3-Benzenediol
Chemical Family: Aromatic
Chemical Formula: $C_6H_4(OH)_2$
C.A.S.: 108-46-3
Product Use: For test purposes

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

City University of Hong Kong

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Odour And Appearance:

White needle-like crystals but becomes pink on exposure to light and air or by contact with iron.

Odour Threshold (ppm): Not available

Vapour Pressure (mmHg): 1 mmHg @ 108 deg. C

Vapour Density (Air=1): 3.74

Evaporation Rate: No Data

Boiling Point (deg. C): 280 deg. C, but volatilizes at lower temperatures and is slightly volatile with steam.

Melting Point (deg. C): 110 deg. C

pH: 5.2

Specific Gravity: 1.272

Coefficient Of Water/Oil Distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Combustible

Extinguishing Media: Water, dry chemical, CO₂

Flash Point (Method Used): 127 deg. C/cc

Autoignition Temperature: 1126 deg. F

Upper Flammable Limit (% By Volume): Not available

Lower Flammable Limit (% By Volume): Not available

Hazardous Combustion Products: CO, CO₂

REACTIVITY DATA

Stability: Stable

Incompatibility :

Oxidizers, acetanilide, albumin, alkalies, antipyrine, camphor, ferric salts, methol, spirit nitrous ether, urethan.

Hazardous Decomposition Products: CO₂, CO, H₂O

HEALTH HAZARD DATA

Toxicological Data:

LD₅₀: (Oral, Rat) 301 mg/kg

LC₅₀: Not available

Effects Of Acute Exposure To Product:

Inhaled: Harmful

In Contact With Skin:

Harmful and irritating to skin. Absorption can cause methemoglobinemia, cyanosis, convulsions and death.

In Contact With Eyes: Causes irritation and burns.

Ingested: Harmful

Effects Of Chronic Exposure To Product:

Carcinogenicity: No

Teratogenicity: No information available

Reproductive Effects: No information available

Mutagenicity: No information available

Synergistic Products: None known

FIRST AID MEASURES

Eyes: Irrigate thoroughly with water for at least ten (10) minutes. Obtain medical attention.

Skin:

Remove contaminated clothing avoiding contamination of unaffected areas and swab contaminated skin with glycerol, polyethylene glycol 300, or a mixture of liquid polyethylene glycol 70 parts and methylated spirits 30 parts for at least ten (10) minutes. Flush with water for at least ten (10) minutes if solvents are not immediately available.

Inhalation:

Remove from exposure, rest and keep warm. In severe cases, or if exposure has been great obtain medical attention.

Ingestion:

Wash out mouth thoroughly with water and give water to drink, followed by two tablespoons of magnesium sulphate (Epsom salts) in water. Obtain medical attention.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation recommended

Respiratory Protection: Self-contained breathing apparatus, dust mask.

Eye Protection: Goggles for face shield.

Skin Protection: Rubber or plastic gloves.

Other Personal Protective Equipment: An eyewash and safety shower should be nearby and ready for use.

Handling Procedures And Equipment: Follow routine safe handling procedures. Avoid generating dust.

Storage Requirements:

Store in suitable labelled containers. Keep containers tightly closed when not in use and when empty. Protect from damage. Store in a cool, dry, well-ventilated area, out of direct sunlight.

ENVIRONMENTAL PROTECTION DATA

Leak And Spill Procedure:

Mix with sand. Transfer carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SILVER NITRATE****0081****PRODUCT INFORMATION**

Chemical Name: Silver Nitrate

Chinese Name: 硝(V)酸銀

Common Names/Synonyms: Lunar Caustic; Nitric Acid; Silver (+1) Salt

Formula: AgNO_3

C.A.S.: 776-18-88

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

Boiling Point: 832 deg. F

Melting Point, deg. F: 413.6

Vapour Pressure, mmHg/20 deg. C: Not applicable

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Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): 4.35 Water Solubility, %: High
Appearance And Odour: White to colourless crystals; odourless
Evaporation Rate (Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable
Extinguishing Media: Use any appropriate medium for extinguishing surrounding fire.
Flash Point: Not Flammable
Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable
Special Fire Fighting Procedures: None.
Unusual Fire And Explosion Hazards: None.

REACTIVITY DATA

Stability: Stable
Polymerization: Will not occur
Incompatibility:
Strong oxidizing or reducing materials, alkalis, alcohols, ammonium hydroxides, antimony salts, arsenites, bromides, carbonates, chlorides, iodides, thiocyanates, ferrous salts, morphine salts, oils, creosote, phosphates, tannic acid, tartrates, vegetable decoctions and extracts, charcoal, sulfur, phosphorus, plastics, acetylene, acetylides.
Hazardous Decomposition Products:
Thermal decomposition or burning may produce metallic silver and nitrogen oxides.
Conditions To Avoid: Excessive heat and contamination of any kind.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact
Signs And Symptoms Of Exposure:
Inhalation:
Breathing dust causes irritation and/or burns of the nose, throat, mucous membranes and respiratory tract. Repeated exposure may produce generalized argyria.
Eye Contact: Dusts irritate the eyes. Contact with crystals causes burns.

Skin Contact:

Contact with the crystals causes irritation and/or burns. Prolonged or repeated contact with crystals or dust may result in localized argyria.

Swallowed: Swallowing the solids can cause severe gastroenteritis that may be fatal.

Chronic Effects Of Exposure: No specific information available.

Medical Conditions Generally Aggravated By Exposure: None known.

Oral: muskrat LD₅₀ = 29 mg/kg; rat LDLO = 800 mg/kg

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed: Do not induce vomiting. Get immediate medical attention.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection:

NIOSH-approved dust respirator or mask in the absence of adequate environmental controls at the point of use.

Eye Protection: Chemical goggles.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.
Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry place. Store away from all other chemicals and potential sources of contamination. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

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ENVIRONMENTAL PROTECTION DATA

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Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and chemical goggles. Due to high cost of material, if it is not contaminated, it is suitable for reuse after cleanup.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM CYANIDE****0084****PRODUCT INFORMATION**

Chemical Name: Sodium Cyanide

Chinese Name: 氰化鈉

Common Synonyms: Cyanobrik (R);

Cyanogran (R); Cyanide Of Sodium; Prussiate Of Soda

Formula: NaCN

C.A.S.: 143-33-9

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

Boiling Point: 2,725 deg. F

Melting Point, deg. F: 1,047

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Vapour Pressure, mmHg/20 deg. C: Nil
Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): 1.6
Water Solubility, %: 37
Appearance And Odour: White granular solid; slight ammonia and almond odour.
Evaporation Rate (Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media:

Flood with water. Do not use CO₂ which reacts with sodium cyanide to produce highly toxic and flammable hydrogen cyanide gas.

Flash Point: Not Flammable

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire. Sodium cyanide dissolves readily in water, therefore cyanide solution run-off may occur if containers are opened. run-off should be contained and detoxified with hypochlorite. be extremely cautious not to inhale any fumes during a fire because highly toxic HCN gas may be liberated.

Unusual Fire And Explosion Hazards: Hydrogen cyanide gas is flammable and highly toxic.

REACTIVITY DATA

Stability: Moisture Causes Decomposition.

Polymerization: Will not occur

Incompatibility:

Reacts violently with strong oxidizers. Large amounts of highly toxic, flammable hydrogen cyanide (HCN) gas will evolve from contact with acids. Water or weak alkaline solution can produce dangerous amounts of hcn in confined areas. Carbon dioxide from the air is sufficiently acidic to liberate highly toxic hydrogen cyanide gas from cyanide solutions.

Hazardous Decomposition Products: Poisonous HCN and ammonia gases.

Conditions To Avoid: Moisture, heat.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, skin absorption.

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Signs And Symptoms Of Exposure:

Inhalation: Inhalation of dust will cause respiratory tract irritation and may be fatal.

Eye Contact: Dusts will irritate the eyes and prolonged contact may burn and/or damage the eyes.

Skin Contact:

Exposure to the dust will cause irritation. Prolonged or repeated contact may result in an itching rash characterized by macular, popular, and vesicular eruptions. Frequently there is secondary infection. Fatal amounts of sodium cyanide can be absorbed through the skin.

Swallowed:

Swallowing the solid can cause death. Cyanides inhibit tissue oxidation causing death through chemical asphyxia.

Chronic Effects Of Exposure:

Exposure to small amounts of cyanide compounds over long periods of time is reported to cause loss of appetite, headache, weakness, nausea, dizziness, and symptoms of irritation of the upper respiratory tract and eyes.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Rat LD₅₀ = 6.44 mg/kg; Human LDLO = 2.857 mg/kg

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

First Aid For Cyanide Exposure:

Actions to be taken in case of cyanide exposure should be planned and practised before beginning work with cyanides (in most cases, cyanide poisoning causes a deceptively healthy pink to red skin color; however, if a physical injury or lack of oxygen is involved, the skin color may be bluish.

Treatment for cyanide poisoning can be provided in two ways, "first aid" and "medical treatment". Both require immediate action to prevent further harm or death. First aid using amyl nitrite and oxygen is generally given by a layman before medical help arrives. Medical treatment involves intravenous injections and must be administered by qualified medical personnel. Even if a doctor or nurse is present, the need for fast treatment dictates using first aid treatment with amyl nitrite and oxygen while medical treatment materials for intravenous injection are being prepared. Experience shows that first aid given promptly is usually the only treatment needed.

Medical treatment is given if the victim does not respond to first aid. it provides a larger quantity of antidote including sodium thiosulfate to chemically destroy cyanide in the body. However, even under

optimum conditions, amyl nitrite can be administered faster and should be used even if medical treatment follows.

Amyl nitrite and medical treatment kits for cyanide poisoning are available, with doctor's prescription, from pharmacies.

First aid -- directions for giving amyl nitrite antidote and oxygen

1. Conscious: for inhalation and/or absorption if the victim is alert, oxygen may be all that is needed. But if he is not fully conscious or shows signs of poisoning, follow paragraph 2 below. For swallowing, see first aid -- swallowing cyanide.

2. Unconscious but breathing: break an amyl nitrite ampule in a cloth and hold lightly under the victim's nose for 15 seconds, then take away for 15 seconds. Repeat 5-6 times. If necessary, use a fresh ampule every 3 minutes until the victim regains consciousness (usually 1-4 ampules). Give oxygen to aid recovery.

3. Not Breathing:

A. Give artificial respiration, preferably with an oxygen resuscitator. Give amyl nitrite antidote by placing a broken ampule inside the resuscitator face piece, being careful that the ampule does not enter the victim's mouth and cause choking.

B. If using manual artificial respiration, give amyl nitrite antidote as in paragraph 2 above, except keep the first amyl nitrite ampule under the nose with replacement every 3 minutes.

4. Amyl Nitrite Notes:

A. Amyl nitrite is highly volatile and flammable; do not smoke or use around source of ignition.

B. If treating poison victim in a windy or drafty area, provide something -- a rag, shirt, wall, drum, cupped hands, etc. -- to prevent the amyl nitrite vapours from being blown away. Keep the ampule upwind from the nose. The objective is to get amyl nitrite into the victim's lungs.

C. Rescuers should avoid amyl nitrite inhalation so they won't become dizzy and lose competence.

D. Do not overuse. Amyl nitrite dilates the blood vessels and lowers blood pressure. While excessive use might put the victim in shock, this has not occurred in practice at DUPONT manufacturing facilities, and dupont company is not aware of any death from treatment with amyl nitrite.

If Inhaled:

Remove to fresh air. Lay victim down. Administer amyl nitrite antidote and oxygen. Remove contaminated clothing. Keep patient quiet and warm. call a physician.

In Case Of Eye Contact:

Immediately flush eyes with plenty of water, remove contaminated clothing, and keep victim quiet and warm. Call a physician.

In Case Of Skin Contact:

Wash skin to remove the cyanide while removing all contaminated clothing, including shoes. Do not delay. Skin absorption can occur from cyanide dust, solutions, or hcn vapour. Absorption is slower than inhalation, usually measured in minutes compared to seconds for inhalation. follow first aid directions

for giving amyl nitrite antidote and oxygen (above) if treatment is needed, but even severe skin contact may not require treatment if 1) no inhalation or swallowing has occurred; and 2) the cyanide is promptly washed from the skin and contaminated clothing removed. If skin contact is prolonged, hcn poisoning may occur with nausea, unconsciousness, and then death possible if source of cyanide intake is not removed and treatment provided. Even after washing the skin, the victim should be watched for at least 1-2 hours because absorbed cyanide can continue to work into the bloodstream. Wash clothing before reuse and destroy contaminated shoes.

If Swallowed:

Conscious: immediately give patient one pint of 1% sodium thiosulfate solution (or plain water) by mouth and induce vomiting with finger in throat. Repeat until vomit fluid is clear. Never give anything by mouth to an unconscious person. Call a physician. unconscious: follow first aid procedure as in paragraphs 2 and 3 above and call a physician. If the victim revives, then proceed with *conscious* paragraph immediately above.

Note To Physician:

Medical treatment is normally provided by a physician, but might be provided by a professionally trained "qualified medical person" where a need exists and where state and local laws permit. While preparing for sodium nitrite and sodium thiosulfate injections, use amyl nitrite and oxygen as outlined in directions for giving amyl nitrite first aid. When ready and if the victim is not responding to first aid, first inject the solution of sodium nitrite (10 ml of a 3% solution) intravenously at the rate of 2.5 ml/minute, then immediately inject the sodium thiosulfate (50 ml of a 25% solution) at the same rate, taking care to avoid extravasation. This is a fairly lengthy treatment (24 minutes) since a total of 10 + 50, or 60 ml is injected at a rate of 2.5 ml/minute. consideration should be given to the size and conditions of the victim as treatment is proceeding. It is not essential that full quantities be given just because treatment was started. Injections can be stopped at any point if recovery is evident. Watch patient continuously for 24 - 48 hours if cyanide exposure was severe. If there is any return of symptoms during this period, repeat this treatment using one-half the amounts of sodium nitrite and sodium thiosulfate solutions. Caution should be used to avoid overuse of medical treatment chemicals as the prescribed dose is about 1/3 the lethal dose for an average individual. If signs of excessive methemoglobinemia develop (ie, blue skin and mucous membranes, vomiting, shock and coma), 1% methylene blue solution should be given intravenously. A total dose of 1 to 2 mg/kg of body weight should be administered over a period of five to ten minutes and should be repeated in one hour if necessary. In addition, oxygen inhalation will be helpful. Transfusion of whole fresh blood may be considered if there has been mechanical injury with external or internal bleeding and simultaneous cyanide exposure. The experience of dupont company, a cyanide producer, in treating cyanide poison cases is that first aid procedures using amyl nitrite and oxygen were effective and the only treatment needed in most cases. Medical treatment, using intravenous injections, was used in a few cases. Both procedures have been successful.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection:

If use conditions generate dusts, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, rubber boots, rubber gloves, and rubber apron.

Other Protective Measures:

An eyewash and safety shower should be nearby and ready for use. First aid and medical treatment supplies, including oxygen resuscitators, should be ready for use by trained personnel.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place. Store away from all other chemicals and potential sources of contamination. Do not store near combustibles or flammables. Do not handle or store food, beverages, or tobacco in cyanide areas. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Do not store near acids or oxidizers.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped with particulate filters may be satisfactory. In any event, always wear eye protection. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil. Keep spillage dry. Flush spill area with a dilute solution of sodium or calcium hypochlorite. This material is highly toxic to marine life.

Material Safety Data Sheet

City University of Hong Kong

MSDS SODIUM HYDROXIDE, PELLETS 0085**PRODUCT INFORMATION**

Chemical Name : Sodium Hydroxide

Chinese Name: 氫氧化鈉

Synonym: Caustic Soda, Lye; Caustic Soda Bead, Dry Or Solid

Formula: NaOH

C.A.S.: 1310-73-2

Product Use:

In rayon and cellophane manufacture; textile industry; food industry; photoengraving and lithography; water treatment; soap manufacture; in plastic and rubber industry; pharmaceutical and chemical industry.

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Appearance And Color: White pellets. hygroscopic.
Odour Threshold: Odourless
Boiling Point: 1390 deg. C
Freezing Point:
(Melting Point): 318 deg. C
Solubility In Water: 29.6% by wt. @ 0 deg. C.
Evaporation Rate (Ether = 1.0): Negligible at ambient conditions
Slow <0.3 Fast >3.0
Medium 0.3-3.0
Specific Gravity (H₂O=1): 2.13 @ 25 deg. C Solid
pH: 5% Solution: 14
% Volatiles By Volume: (@ 20 deg. C) Negligible at ambient conditions
Vapour Density (Air=1): Vapour negligible at ambient conditions
Vapour Pressure:(mmHg @ 20 deg. C) (Psig) Negligible 1 mm @ 739 deg. C
Molecular Weight: 40.00
Coefficient Of Water/Oil Distribution: Not available

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Not flammable
Flash Point:
Hazardous Combustion Products: Some material may vaporize in a fire.
% By Vol. In Air Upper Flammable Limit: Lower Flammable Limit:
Auto Ignition Temperature:
Explosion Hazards:
Will react with metals such as aluminum, tin and zinc (and alloys of these metals) to liberate hydrogen - a fire and explosive hazard.

Fire Extinguishing Procedures:
Do not use CO₂ because it reacts exothermically with NaOH. Flood with water if involved in fire. Do not splash or scatter material, keeping it away from common metals (see above). NaOH can melt in a fire and molten material can react violently with small amounts of water.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibility :
Common metals and their alloys; acids and their anhydrides; easily oxidizable compounds, including explosives, aldehydes and unsaturated organics; nitrocarbons and chlorocarbons. Strong exothermic reaction with water or moisture (generates much heat).

Hazardous Decomposition Products:

None. Remains chemically unchanged even at its boiling temperature.

Conditions To Avoid: Open containers - rapidly absorbs carbon dioxide and moisture from the air.

HEALTH HAZARD DATA

Inhalation:

Inhalation of mist or dust can injure the entire respiratory tract with painful and corrosive action on tissue. Irritancy estimated to become noticeable at 2 mg/m^3 . In air. The effects of inhalation can vary, depending upon extent of exposure, from mild mucous membrane irritation to sudden, severe bronchopneumonia.

Ingestion:

Severe and rapid corrosive burns of mouth, gullet and gastrointestinal tract will result, if swallowed. Effects include severe pain, difficulty in breathing, vomiting, diarrhea, collapse. Some effects may be delayed. Estimated average fatal dose 5 g. (human, adult).

Skin:

Severe and rapid corrosion from contact. Extent of damage depends on duration of contact. Even dilute solutions exert a destructive effect, following prolonged contact. Mist of solutions is extremely corrosive. skin - rabbit: 50 mg/24 hours/severe effect.

Eyes:

Contact rapidly causes severe damage. Permanent corneal damage almost inevitably results. Even dilute solutions may produce similar effects, although less rapidly. Mist of solutions is extremely corrosive. Eye - rabbit: 50 micrograms/24 hours/severe effect.

Acute Toxicity: Very toxic.

LDLO (Oral, Rabbit): 500 mg/kg (10% Solution)

LD50 (Intraperitoneal, Mouse): 40 mg/kg

Chronic Toxicity: Not available

Exposure Limits: TLV: 2 mg/m^3 (Ceiling Value)

FIRST AID MEASURES

Inhalation:

Remove to fresh air (to be handled by protected personnel). If breathing is difficult, or if cyanotic (blue skin), give oxygen if qualified operator is available. Arrange for medical help.

Ingestion:

Do not induce vomiting. If possible, and if conscious, immediately give large quantities of water or milk. This may be followed with dilute vinegar or fruit juice to neutralize alkali. Arrange for immediate medical help.

Skin:

Immediately flush under safety shower. If wearing goggles, flush head and face thoroughly before removing goggles. Next, wash victim's hands until all chemical is removed. Then remove contaminated clothing and shoes. Call a physician. Continue washing for one or two hours and remove to a medical facility if a physician is not available (but only after at least one hour of showering).

Eyes:

Immediately flush with large amounts of water for at least 15 minutes, holding eyelids apart to facilitate irrigation. Utmost speed is essential. Call a physician. If none is available, irrigate another 15-30 minutes before moving patient to a medical facility. Have an ophthalmologist make an evaluation of eye injury.

PREVENTATIVE MEASURES

Respiratory Protection:

In the absence of dust or mist, none generally required. For airborne levels of concern, use a NIOSH-approved, full-facepiece (for eye protection) with a high-efficiency particulate or supplied-air respirator, or a self-contained breathing apparatus.

Eyes And Face:

Wear chemical safety goggles if there is any possibility of contact with liquid or mist with the eyes. Add a face shield if there is any possibility of contact with liquid with face. Do not wear contact lenses if handling liquid or dusty solid material.

Hands, Arms, And Body:

Wear protective gloves and full protective clothing (preferably made of rubber, neoprene or nbr) if there is any possibility of contact with pellets, dust or liquid or mist. Promptly wash any contaminated impervious items and remove immediately any non-impervious items that become contaminated.

Storage:

Store in closed containers in a dry, well-ventilated area, separate from acids, peroxides, metals, easily ignitable materials and other incompatibles. Protect against moisture and water; protect against physical damage. Drains for storage or use areas for this material should have retention basins for pH adjustment and dilutions of spills and flushings before discharge.

Normal Handling:

Do not get in eyes, on skin or clothing. Avoid breathing dust or mist, if generated. Keep container closed when not in use. Use with adequate ventilation and wash thoroughly after handling. When making solutions, use sufficient agitation and cooling, while adding slowly to surface of solution, to avoid splattering. Avoid handling conditions that may lead to spills, leaks, ejections, or to the formation of dust or mist.

Engineering Controls:

Provide local exhaust to meet TLV requirements if making solutions or grinding up and mist or dust is generated. In the absence of these conditions, natural ventilation may be adequate. Ventilation facilities should be corrosion resistant. (do not use soft iron, copper, tin, aluminum, zinc or alloys of these materials in construction or in handling equipment.) Provide eyewash stations and quick-drench showers near areas of use and handling. In the event hydrogen gas is generated, a severe ventilation problem is rapidly introduced. Therefore, if such emergency condition is likely to happen, then ventilation facility must also be explosion resistant.

ENVIRONMENTAL PROTECTION DATA

Spill Or Leak (Always Wear Personal Protective Equipment):

Dry product can be promptly shovelled up for recovery. (Caution! Avoid dusting and skin and eye contact. Also, delay in clean-up may allow absorption of moisture from the atmosphere, increasing clean-up difficulties.) Control the disposal of the waste solid. Flush contaminated surfaces with water and neutralize with dilute acid (preferably acetic acid) to remove final traces. (sodium bicarbonate may also be used to partially neutralize.) Finally, rinse area with water; attempt to keep out of sewer.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM SULFATE****0087****PRODUCT INFORMATION**

Chemical Name: Sodium Sulfate

Chinese Name: 硫酸鈉

Synonym: Disodium Sulfate; Sodium Sulfate Anhydrous

Formula: Na_2SO_4

C.A.S.: 7757-82-6

Product Use:

In the manufacture of glass, ultramarine, paper pulp; for standardizing dyes and in dyeing and printing textiles; in freezing mixtures.

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Appearance And Color: White powder or granular material.
Odour Threshold: Odourless
Boiling Point: NA
Freezing Point: NA
(Melting Point): 888 deg. C
Solubility In Water: 17% @ 20 deg. C (By Weight)
Evaporation Rate (Ether = 1.0): Not applicable
Slow <0.3 Fast >3.0
Medium 0.3-3.0
Specific Gravity (H₂O=1): 2.68
pH: 5% Solution @ 25 deg. C
pH: 5.2-8.2
% Volatiles By Volume:(@ 20 deg. C) Not applicable
Vapour Density (Air=1): Not applicable
Vapour Pressure: (Mmhg @ 20 deg. C) (Psig) Not applicable
Molecular Weight: 142.04
Coefficient Of Water/Oil Distribution: Not available

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Not flammable. Flash Point: NA
Hazardous Combustion Products: Not applicable
% By Vol. In Air Upper Flammable Limit: Not applicable
Lower Flammable Limit: Not applicable
Auto Ignition Temperature: NA
Explosion Hazards: Not applicable unless sodium sulfate is melted with aluminum.
Fire Extinguishing Procedures:
Although not flammable, if involved in a fire, firefighters should wear full protective clothing and, if acrid fumes develop, use NIOSH-approved, self-contained breathing apparatus. Cool fire-exposed containers with water spray.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibility : Molten active metals, including aluminum and magnesium.
Hazardous Decomposition Products: Not applicable.
Conditions To Avoid: Protect from moisture (hygroscopic); keep tightly closed.

HEALTH HAZARD DATA

Inhalation: Dust inhalation may irritate nose, throat and lungs.

Ingestion:

Not generally considered toxic (oral-mouse LD₅₀: 5989 mg/kg). however, if swallowed, irritation may develop in the mouth, esophagus and stomach. the sulfate ion draws water into the intestines and causes purging.

Skin:

Effects of sodium sulfate are minimal, but irritation may result from prolonged skin contact.

Eyes: Contact with dust or mist may irritate eyes.

Acute Toxicity: Low toxicity - see above.

Chronic Toxicity: Not available

Exposure Limits: None established

Other: Teratogenicity data: parenteral, mouse, TDLO 60 mg/kg (8d preg.) - effects on fetus.

Biological Exposure Indices (BEI.): Not available.

FIRST AID MEASURES

Inhalation:

Remove to fresh air; if breathing is difficult, give oxygen if a qualified operator is available. Get medical attention for irritation or discomfort from dust inhalation.

Ingestion:

If conscious, give 2 to 4 glasses of water, then induce vomiting by touching back of throat with finger. Get medical attention.

Skin:

Wash with soap and water, then flush with water until all chemical is removed. Remove contaminated clothing and wash before reuse.

Eyes:

Flush promptly with plenty of water for at least 15 minutes; get medical attention if irritation persists.

PREVENTATIVE MEASURES

Respiratory Protection:

Under normal conditions, none required. Where dusty conditions develop, use niosh-approved respirator for dusts.

Eyes And Face:

Under normal conditions, wear safety glasses in the workplace. Under dusty conditions, wear chemical safety goggles. Do not wear contact lenses.

Hands, Arms, And Body:

Wear long-sleeve shirt and trousers and gloves for routine product use or handling.

Storage: Store in a cool, dry place. Keep well closed and protect from moisture.

Normal Handling:

Avoid contact with skin, eyes or clothing. Avoid breathing dust. Wash thoroughly after handling and follow good hygiene and housekeeping practices. Keep containers closed. Handle in a manner to minimize dusting.

Engineering Controls:

Natural ventilation may be adequate in the absence of dusty conditions. If dusty conditions prevail, provide local exhaust.

ENVIRONMENTAL PROTECTION DATA

Spill Or Leak (Always Wear Personal Protective Equipment):

Shovel up dry chemical for use or disposal. Sweep up with a minimum of dusting and maximize recovery. Flush residue with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SULFURIC ACID****0090****PRODUCT INFORMATION**

Chemical Name: Sulfuric Acid

Chinese Name: 硫酸

Common Synonyms:

Sulfuric Acid; Oil Of Vitriol; Sulfuric Acid > 93%; Sulfuric Acid > 66 Deg Be; Sulfuric Acid > 1.83 Specific Gravity; Sulfuric Acid Reagent.

Formula: H₂SO₄

C.A.S.: 7664-93-9

RISK SYMBOL**PHYSICAL DATA**

Physical State:Liquid

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Boiling Point : A = 529 deg. F; B = 590 deg. F
Vapour Pressure, mmHg/20 deg. C: A,B = Nil
Freezing Point : A = -20 deg. F; B = 30 deg. F
Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): A = 1.835; B = 1.84
Water Solubility, %: Complete
Appearance And Odour: Colourless to pale yellow, oily liquid. Odourless.
Evaporation Rate (Butyl Acetate=1): <1

A = 93% or 66 deg be sulfuric acid; B = 99% sulfuric acid

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Flash Point : None

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Extinguishing Media:

This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Special Fire Fighting Procedures:

Fire fighters should wear selfcontained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Extinguish all nearby sources of ignition since flammable hydrogen gas will be liberated from contact with some metals. Keep water out of containers.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility:

Alkalis, oxidizing or reducing materials, cyanides, sulfides, or combustible materials. Reacts with many metals. Concentrated acid reacts violently with water.

Hazardous Decomposition Products:

May liberate carbon monoxide, carbon dioxide, and oxides of sulfur.

Conditions To Avoid: None

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin Or Eye Contact

Signs And Symptoms Of Exposure:

Inhalation:

Vapours and mists are extremely corrosive to the nose, throat, and mucous membranes. Bronchitis, pulmonary edema, and chemical pneumonitis may occur. Irritation, coughing, chest pain, and difficulty in breathing may occur with brief exposure while prolonged exposure may result in more severe irritation and tissue damage. Breathing high concentrations may result in death.

Eye Contact:

Vapours, liquid, and mists are extremely corrosive to the eyes. Brief contact of the vapours will be severely irritating. Brief contact of the liquid or mists will severely damage the eyes and prolonged contact may cause permanent eye injury which may be followed by blindness.

Skin Contact:

Vapours, mists, and liquid are extremely corrosive to the skin. Vapours will severely irritate the skin and liquid and mists will severely burn the skin. Prolonged liquid contact will burn or destroy surrounding tissue and death may accompany burns which extend over large portions of the body.

Swallowed:

Vapours, mists, and liquid are extremely corrosive to the mouth and throat. Swallowing the liquid burns the tissues, causes severe abdominal pain, nausea, vomiting, and collapse. Swallowing large quantities can cause death.

Chronic Effects Of Exposure:

May cause erosion of the teeth, lesions on the skin, bronchial irritation, coughing, and pneumonia.

Medical Conditions Generally Aggravated By Exposure: Acute and chronic respiratory diseases.

Oral: Rat LD₅₀ = 2,140 mg/kg

Dermal: No data found

Inhalation: Guinea Pig LC₅₀ = 18 mg/m³

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

Other Data:

Although one limited study of refinery workers did suggest a possible link between sulfuric acid exposure and laryngeal cancer, the study was limited because of the small number of workers and the mixed exposures to several other materials including diethyl sulfate, an IARC and NTP carcinogen. Based on the overall weight of evidence from all animal toxicity and human epidemiological studies, no

cause-and-effect relationship between cancer and sulfuric acid exposure has been shown. individuals with preexisting disease of the lungs may have increased susceptibility to the toxicity of excessive exposures.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 30 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 30 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water or milk. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the pel.

Respiratory Protection:

Wear a NIOSH-approved respirator appropriate for the vapour or mist concentration at the point of use. Appropriate respirators may be a full facepiece air-purifying cartridge respirator equipped for acid gases/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles and full faceshield unless a full face-piece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing:

Acid-resistant slicker suit with rubber apron, rubber boots with pants outside, and rubber gloves with gauntlets.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Vent container carefully, as needed, to relieve pressure. keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

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ENVIRONMENTAL PROTECTION DATA
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Action To Take For Spills Or Leaks:

Wear acid-resistant slicker suit and complete protective equipment including rubber gloves, rubber boots, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full face-piece air-purifying cartridge respirator equipped for acid gases may be satisfactory. In any event, always wear eye protection. Remove all sources of ignition. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent material and carefully neutralize with soda ash or lime. If soda ash is used, provide adequate ventilation to dissipate The carbon dioxide gas. Keep non-neutralized material out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**THIOUREA****0094**

PRODUCT INFORMATION

Chemical Name: Thiourea

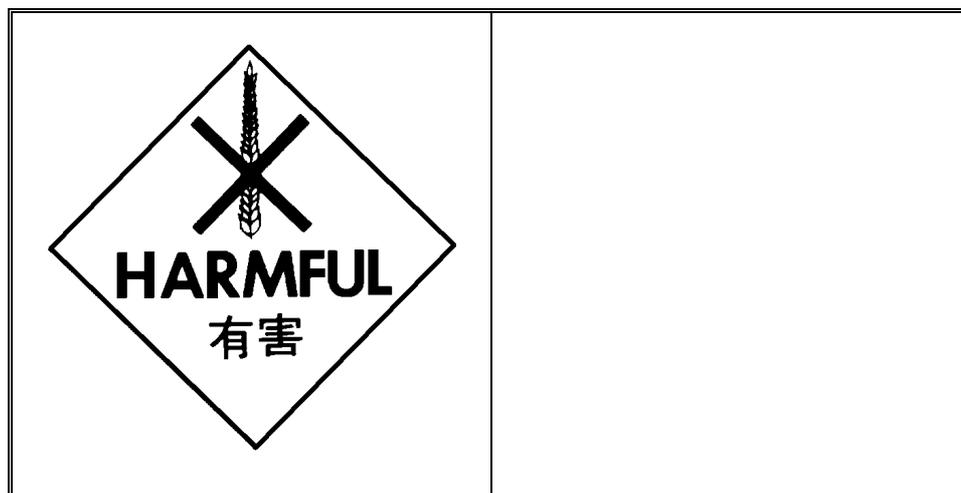
Chinese Name: 硫脲

Common Names/Synonyms: Thiocarbamide

Formula: NH_2CSNH_2

C.A.S.: 62-56-6

RISK SYMBOL



PHYSICAL DATA

Physical State: Solid

Boiling Point: Decomposes

Melting Point: Approx.355 deg. F

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Vapour Pressure, mmHg/20 deg. C: Not applicable
Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): 1.406
Appearance And Odour: No odour - white crystals
Evaporation Rate (Butyl Acetate=1): Nil

Water Solubility, %: 1.36

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media: Use water spray, dry chemical, CO₂, or alcohol foam.

Flash Point: Not applicable

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards: May emit sulfur dioxide above 360 deg. F.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility: Acrylaldehyde, hydrogen peroxide and nitric acid.

Hazardous Decomposition Products: May liberate carbon monoxide, carbon dioxide, and oxides of sulfur.

Conditions To Avoid: Heat, sparks, and open flames.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, skin or eye contact.

Signs And Symptoms Of Exposure:

Inhalation: Breathing dust may irritate the nose and throat and cause coughing and chest discomfort.

Eye Contact: Dusts may irritate the eyes.

Skin Contact: Causes allergic reactions.

Swallowed: Irritant to digestive tract.

Chronic Effects Of Exposure:

This product is a sensitizer in persons who exhibit photosensitivity; it has produced goitre and bone marrow depression (anemia, leukopenia, thrombocytopenia and agranulocytosis) in experimental animals. Thiourea appears to be highly toxic orally, in animals, however, its toxicity in rats varies from strain to strain. Upon chronic administration thiourea can cause hepatic tumors; it is an invitro and

in vivo mutagen via multiple test systems; it has also been shown to cause reproductive effects in animals.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Rat LD₅₀ = 1750 mg/kg

Dermal: Rabbit LD₅₀ > 2800 mg/kg

Inhalation: Rat LC₅₀ = 2170 mg/m³

Carcinogenicity:

This product is considered an animal carcinogen by NTP and IARC. It is not considered a carcinogen by OSHA.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection:

Wear a niosh-approved respirator appropriate for the dust concentration at the point of use. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, and gloves.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags or fibre drums dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped with particulate filters may be satisfactory. In any event, always wear eye protection. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**STANNOUS CHLORIDE****0095****PRODUCT INFORMATION**

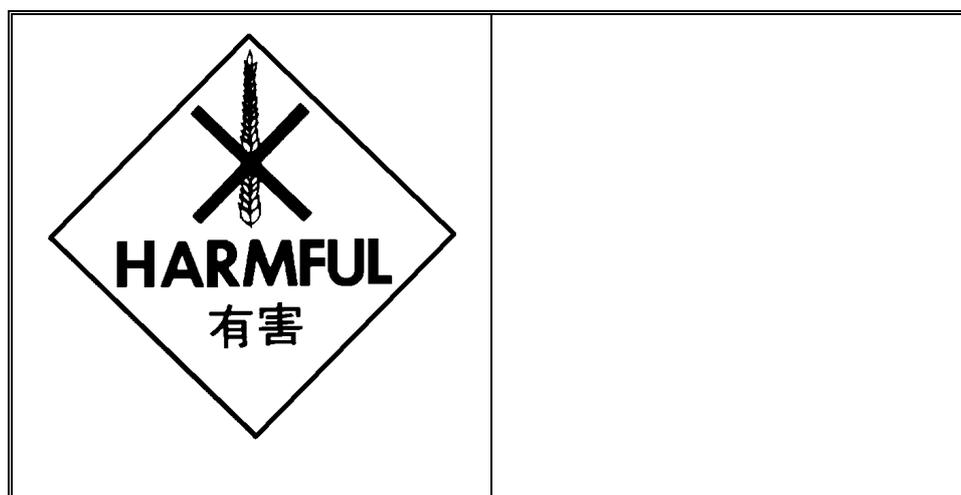
Chemical Name: Stannous Chloride

Chinese Name: 氯化錫(II)

Common Synonyms: Tin Chloride; Stannous Chloride Dihydrate

Formula: $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$

C.A.S.: 7772-99-8

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

Boiling Point: N/A

Melting Point: 100 deg. F

Vapour Pressure, mmHg/20 deg. C: N/A

Vapour Density (Air=1): N/A

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Specific Gravity (Water=1): 2.71 Water Solubility, %: 46
Appearance And Odour: White crystals; no odour
Evaporation Rate (Butyl Acetate=1): <1

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media: This material is not combustible.

Flash Point: None

Flammable Limits In Air, % Lower: N/A Upper: N/A

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Extinguish all nearby sources of ignition since flammable hydrogen gas will be liberated from contact with some metals.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility: Oxidizers.

Hazardous Decomposition Products: May liberate irritating fumes.

Conditions To Avoid: None

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact

Signs And Symptoms Of Exposure:

Inhalation: Breathing dust may irritate the nose and throat and cause coughing and chest discomfort.

Eye Contact: Dusts will irritate the eyes and prolonged contact may damage the eyes.

Skin Contact: Prolonged or repeated contact with the dust will irritate the skin.

Swallowed: Swallowing the dusts or solids will cause nausea and vomiting.

Chronic Effects Of Exposure: No specific information available.

Medical Conditions Generally Aggravated By Exposure: None known.

Oral: Rat LD₅₀ = 700 mg/kg

Dermal: No data found.

Inhalation: No data found.

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration

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FIRST AID MEASURES

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If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

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PREVENTATIVE MEASURES

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Ventilation:

Local mechanical exhaust ventilation capable of maintaining dust emissions at the point of use below the PEL.

Respiratory Protection:

NIOSH-approved dust respirator or mask in the absence of adequate environmental controls at the point of use.

Eye Protection: Chemical goggles.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry place. Keep bags dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and chemical goggles. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep this product out of sewers, storm drains, surface waters, and soil. This product is toxic to aquatic life.

Material Safety Data Sheet

City University of Hong Kong

MSDS**TOLUENE****0096****PRODUCT INFORMATION**

Chemical Name: Toluene

Chinese Name: 甲苯

Common Synonyms: Toluol; Methyl Benzene

Molecular Weight: 92

Formula: $C_6H_5CH_3$

C.A.S.: 108-88-3

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Boiling Point : 231 deg. F(110 deg. C)

Vapour Pressure, mmHg/20 deg. C: 22

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Melting Point : -139 deg. F(-95 deg. C) Vapour Density (Air=1): 3.2
Specific Gravity (Water=1): 0.87 Water Solubility, %: 0.05
Appearance And Odour: Colourless, clear liquid; aromatic odour
Evaporation Rate (Butyl Acetate=1): 2.0
% Volatile (By Volume): 100
pH: N/D

FIRE AND EXPLOSION DATA

Condition Of Flammability: Flammable

Extinguishing Media: Use water spray, dry chemical, foam, or CO₂. Do not use a direct water stream.

Flash Point : 40 deg. F (4.44 deg. C)

Flammable Limits In Air, % Lower: 1.2 Upper: 7.6

Autoignition Temperature: N/D

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Avoid accumulation of water because this product will float on water and may reignite on the surface of the water.

Unusual Fire And Explosion Hazards:

Extinguish all nearby sources of ignition. Avoid accumulation of water because this product will float on water and may reignite on the surface of the water. Vapours formed from this product are heavier than air and may travel along the surface to a distant sources of ignition and flashback. Explosive vapour-air mixtures may be formed above the flash point or between the lower and upper flammable limits. Hot organic chemical vapours or mist are susceptible to sudden spontaneous combustion when mixed with air. Ignition may occur at temperatures below the "autoignition" or "ignition temperature".

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Incompatibility: Oxidizing materials.

Hazardous Decomposition Products:

May liberate carbon monoxide, carbon dioxide, and unidentified organic compounds in black smoke.

Conditions To Avoid: Heat, sparks, and open flames.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation, Skin or eye contact.

Signs And Symptoms Of Exposure:

Inhalation:

Vapours and mists irritate the nose and throat. Inhalation of higher concentrations may cause headaches, nausea, vomiting, and coma. Inhalation of very high concentrations or prolonged exposure may cause unconsciousness or death. Exposures at concentrations up to 200 ppm generally produce no symptoms. At 200-500 ppm, headache, nausea, eye irritation, loss of appetite, a bad taste, lassitude, impairment of coordination and reaction time are reported, but are not usually accompanied by any laboratory or physical findings of significance. With higher concentrations, the above complaints are increased and, in addition, anemia, leucopenia, and enlarged liver may be found in rare cases.

Eye Contact: Liquid is severely irritating.

Skin Contact:

Brief contact may dry the skin. Prolonged or repeated contact may irritate the skin, causing dermatitis.

Swallowed:

Swallowing the liquid may result in vomiting. If vomiting occurs spontaneously, do not allow vomitus to be breathed into the lungs as even a small quantity in the lungs may result in chemical pneumonitis and pulmonary edema/haemorrhage.

Chronic Effects Of Exposure:

Prolonged or repeated exposure to high concentrations may cause loss of appetite, nose bleeds, and liver, kidney, and neural dysfunction.

Medical Conditions Generally Aggravated By Exposure:

Pre-existing eye, skin, and respiratory disorders.

Oral: LD₅₀ RAT = 5 g/kg

Dermal: LD₅₀ Rabbit = 14 g/kg

Inhalation: LC₅₀ Rat = 8,000 ppm/4 hr

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

Other Data:

While there is no evidence that industrially acceptable levels of toluene vapours (the PEL or TLV) have produced cardiac effects in humans, animal studies have shown that inhalation of high levels of toluene produced cardiac sensitization. Such sensitization may cause fatal changes in heart rhythms. This latter effect was shown to be enhanced by hypoxia or the injection of adrenalin-like agents. Rats exposed to 1400 ppm or 1200 ppm of toluene for 14 hr/day for 4 or 5 weeks (respectively) exhibited high frequency hearing deficits. The significance of this information to man is unknown. Can cause irreversible changes

in the genetic material (DNA) of a cell. The human health consequence of these changes is not fully understood. Intentional misuse by deliberate inhalation of toluene has been shown to cause liver, kidney and brain damage. Causes harm to the fetus in laboratory animal studies. The relevance of these findings to humans is uncertain.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

Do not induce vomiting. Get immediate medical attention. If vomiting occurs spontaneously, keep victim's head below his hips to prevent his breathing the vomitus into his lungs.

Notes To Physician:

If more than 2.0 ml per kg has been ingested and vomiting has not occurred, emesis should be induced with supervision. Keep victims head below hips to prevent aspiration. If symptoms such as loss of gag reflex, convulsions occur before emesis, gastric lavage using a cuffed endotracheal tube should be considered.

PREVENTATIVE MEASURES

Ventilation:

Explosion proof ventilation capable of maintaining emissions at the point of use below the PEL.

Respiratory Protection:

If use conditions generate vapours or mists, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator equipped for organic vapours/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing:

Wear chemical resistant gloves and other clothing as required to minimize contact. Test data indicate the best protection is provided by pva gloves.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Handling And Storage Precautions:

Keep away from heat, sparks, and flames. Store in a cool, dry, well-ventilated place away from incompatible materials. Vent container frequently, and more often in warm weather, to relieve pressure. Electrically ground all equipment when handling this product and use only non-sparking tools. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including chemical resistant boots, chemical resistant gloves, chemical resistant apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped for organic vapours may be satisfactory. In any event, always wear eye protection. Extinguish all ignition sources and ensure that all handling equipment is electrically grounded. For small spills or drips, mop or wipe up and dispose of in dot-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent materials and then pump into DOT-approved waste containers; or absorb with non-combustible sorbent material, place residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**UREA****0099****PRODUCT INFORMATION**

Chemical Name: Urea

Chinese Name: 尿素

Common Synonyms: Carbamide; Carbonyl Diamide; Carbonyl Diamine; Carbamidic Acid; De-Icer 821

Formula: NH_2CONH_2

C.A.S.: 57-13-6

RISK SYMBOL

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PHYSICAL DATA

Physical State: Liquid

Boiling Point : Not applicable

Melting Point : 271-275 deg. F

Vapour Pressure, mmHg/20 deg. C: Not applicable

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Vapour Density (Air=1): Not applicable
Specific Gravity (Water=1): 1.335-1.34
Water Solubility, %: >10
Appearance And Odour: White solid, spherical shape (prill) or crystals, slight ammoniacal odour
Evaporation Rate (Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Condition Of Flammability: Non-Flammable

Extinguishing Media:

This material is not combustible. Use extinguishing media appropriate for surrounding fire.

Flash Point : Not applicable

Flammable Limits In Air, % Lower: N/D Upper: N/D

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Extinguish all nearby sources of ignition. Dust can be an explosion hazard, especially when heated.

REACTIVITY DATA

Stability: Stable

Polymerization: Will Not Occur

Incompatibility :

Acids, oxidizing materials, strong bases. Forms an explosive salt with nitric acid, reacts violently with gallium perchlorate, incompatible with sodium nitrate, nitrosyl, perchlorate, corrosive to carbon steel, copper and copper alloys.

Hazardous Decomposition Products:

May liberate carbon monoxide, carbon dioxide, oxides of nitrogen, ammonia, biuret and cyanuric acid.

Conditions To Avoid: Excessive heat and contamination of any kind.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact, inhalation.

Signs And Symptoms Of Exposure:

Inhalation: None currently known.

Eye Contact: Dusts may irritate the eyes.

Skin Contact: Prolonged or repeated contact with the dust may irritate the skin.

Swallowed: None currently known.

Chronic Effects Of Exposure: No specific information available.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Rats LD₅₀ = 14.3 g/kg

DERMAL: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining dust emissions at the point of use below the PEL.

Respiratory Protection:

If use conditions generate dusts, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Safety glasses with side shields. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags or fibre drums dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Keep away from heat and source of ignition.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

This product is intended for use in food, animal feed, drug, or cosmetic manufacture and it has been produced and packaged in accordance with strict quality practices. Maintain this quality level by storing this product away from other chemicals, handling it with care, and avoiding all sources of contamination.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped with particulate filters may be satisfactory. In any event, always wear eye protection. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**XYLENE****0100****PRODUCT INFORMATION**

Chemical Name: Xylene

Chinese Name: 二甲苯

Common Names/Synonyms: Xylol; Dimethyl Benzene; Methyl Toluene

Formula: $C_6H_4(CH_3)_2$

C.A.S.: Mixture

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Boiling Point: 281 deg. F

Melting Point: <0 deg. F

Vapour Pressure, mmHg/20 deg. C: 6-6.7

Vapour Density (Air=1): 3.7

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Skin Contact:

Brief contact may dry the skin. Prolonged or repeated contact may irritate the skin, causing dermatitis.

Swallowed:

Swallowing the liquid may result in vomiting. If vomiting occurs spontaneously, do not allow vomitus to be breathed into the lungs as even a small quantity in the lungs may result in chemical pneumonitis and pulmonary edema/haemorrhage.

Chronic Effects Of Exposure:

Prolonged or repeated exposure to high concentrations may cause neural dysfunction.

Medical Conditions Generally Aggravated By Exposure: Pre-existing eye, skin, and respiratory disorders.

Oral: Rat LD₅₀ > 4.3 g/kg

Dermal: Rabbit LD₅₀ > 2.0 ml/kg

Inhalation: Human TCLO = 200 ppm (Irritation); Rat LC₅₀ = 5,000 ppm/4 h

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

Other Data:

Laboratory animals exposed by various routes to high doses of xylene showed evidence of effects in the liver, kidneys, lungs, spleen, heart, and adrenals. Rats exposed to xylene vapour during pregnancy showed embryo/fetotoxic effects. Mice exposed orally to doses producing maternal toxicity also showed embryo/fetotoxic effects.

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FIRST AID MEASURES
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If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

Do not induce vomiting. Get immediate medical attention. If vomiting occurs spontaneously, keep victim's head below his hips to prevent his breathing the vomitus into his lungs.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the PEL.

Respiratory Protection:

Wear a niosh-approved respirator appropriate for the vapour or mist concentration at the point of use. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator equipped for organic vapours/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing:

Long-sleeved shirt, trousers, safety shoes, neoprene rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Handling And Storage Precautions:

Keep away from heat, sparks, and flames. Store in a cool, dry, well-ventilated place away from incompatible materials. Vent container frequently, and more often in warm weather, to relieve pressure. electrically ground all equipment when handling this product and use only non-sparking tools. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapours. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped for organic vapours may be satisfactory. In any event, always wear eye protection. extinguish all ignition sources and ensure that all handling equipment is electrically grounded. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent materials and then pump into DOT-approved waste containers; or absorb with non-combustible sorbent material, place residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ACETANILIDE****0101****PRODUCT INFORMATION**

Product Name: Acetanilide

Chinese Name: 乙醯代苯胺

Common Synonyms:

Acetic Acid Anilide; N-Phenylacetamide; Acetanil; Acetylaminobenzene; N-Acetylaniline

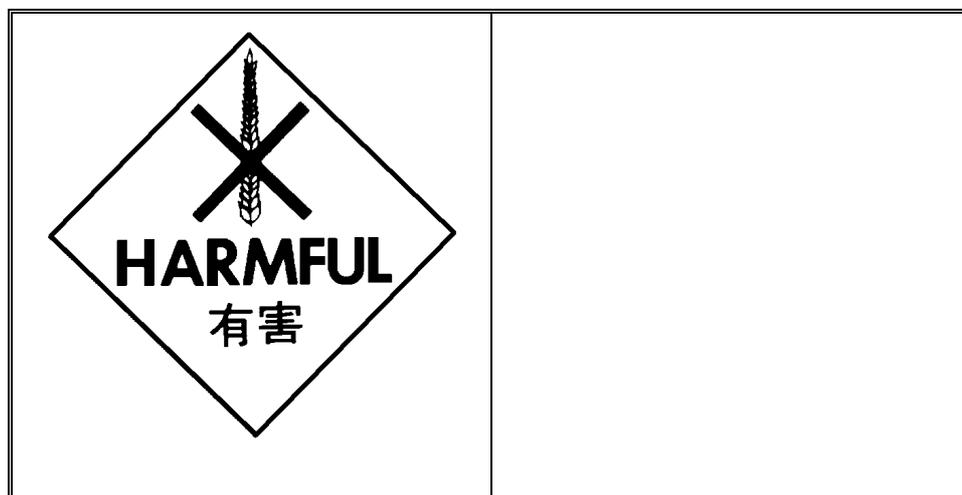
Chemical Family: Amides

Formula: $\text{CH}_3\text{CONHC}_6\text{H}_5$

Formula Wt.: 135.17

CAS No.: 103-84-4

Product Use: Laboratory Reagent

RISK SYMBOL

PHYSICAL DATA

Physical State: Solid

Boiling Point: 304 deg. C (579 deg. F)
(@ 760 mmHg)

Vapor Pressure (mmHg): 1.0
(114 deg. C)

Melting Point: 115 deg. C (239 deg. F)
(@ 760 mmHg)

Vapor Density (Air=1): 4.65

Specific Gravity: 1.16
(H₂O=1)

Evaporation Rate: N/A

Solubility(H₂O): Slight (0.1-1%)

% Volatiles By Volume: 0
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: White to gray powder or flakes. Faint acetic acid odor.

FIRE AND EXPLOSION DATA

Flash Point (Open Cup): 173 deg. C (345 deg. F)

Autoignition Temperature: 539 deg. C (1004 deg. F)

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None Identified.

Toxic gases produced: Oxides of nitrogen, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will Not Occur

Conditions To Avoid: Heat, Flame

Incompatibles: Organic materials, caustics, alkalies, strong oxidizing agents

Decomposition Products: Oxides of nitrogen, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
 Skin Contact: Irritation, prolonged contact may cause dermatitis
 Eye Contact: Irritation
 Skin Absorption: None identified
 Ingestion: Cyanosis, causes methemoglobin formation in the blood
 Chronic Effects: None identified
 Threshold Limit Value (TLV/TWA): Not Established
 Short-Term Exposure Limit (STEL): Not Established
 Permissible Exposure Limit (PEL): Not Established

Toxicity Of Components:

Oral Rat LD ₅₀ For Acetanilide	800 mg/kg
Oral Mouse LD ₅₀ For Acetanilide	1210 mg/kg
Intraperitoneal Rat LD ₅₀ For Acetanilide	540 mg/kg
Intraperitoneal Mouse LD ₅₀ For Acetanilide	500 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No	

Carcinogenicity: None identified.
 Reproductive Effects: None identified.
 Target Organs: Blood
 Medical Conditions Generally Aggravated By Exposure: None identified
 Primary Routes Of Entry: Inhalation, skin contact, ingestion, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS ALUMINUM CHLORIDE, 6-HYDRATE 0102

PRODUCT INFORMATION

Product Name: Aluminium Chloride, 6-Hydrate

Chinese Name: 氯化鋁

Common Synonyms: Aluminium (III) Chloride, Hexahydrate; Aluminium Trichloride, Hexahydrate

Chemical Family: Aluminium Compounds

Formula: $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$

Formula Wt.: 241.43

CAS No.: 7784-13-6

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Boiling Point: N/A

Melting Point: N/A

Specific Gravity: 2.40
(H₂O=1)

Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)

Vapor Pressure (mmHg): N/A

Vapor Density (Air=1): N/A

Evaporation Rate: N/A

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: White to light yellow crystals. Pungent odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None Identified.

Toxic Gases Produced: Hydrogen chloride

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Moisture

Incompatibles: Water

Decomposition Products: Hydrogen chloride

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: May be harmful
Chronic Effects: None Identified
Threshold Limit Value (TLV/TWA): 2 mg/m³
TLV Is For Aluminium, Soluble Salts, As Al.
Short-Term Exposure Limit (STEL): Not Established
Permissible Exposure Limit (PEL): 2 mg/m³
PEL Is For Aluminium, Soluble Salts, As Al.
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:
In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Store in a dry area.

Special Precautions: Material is hygroscopic.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS ALUMINUM CHLORIDE, ANHYDROUS 0103**PRODUCT INFORMATION**

Product Name: Aluminum Chloride, Anhydrous
Chinese Name: 氯化鋁
Common Synonyms: Aluminum Trichloride; Trichloroaluminum
Chemical Family: Aluminum Compounds
Formula: AlCl_3
Formula Wt.: 133.34
CAS No.: 7446-70-0
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 180 deg. C (356 deg. F) Sublimes Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 2.44 Evaporation Rate: N/A
(H₂O=1)

Solubility(H₂O): Decomposes % Volatiles By Volume: 0
(21 deg. C)

pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White to yellow-green powder. Pungent odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use dry chemical or carbon dioxide. Do not use water.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Do not get water inside containers.

Unusual Fire & Explosion Hazards:
A violent exothermic reaction occurs with water. Sufficient heat may be produced to ignite combustible materials. Note: sublimes at melting point. toxic gases produced: hydrogen chloride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture, Sunlight
Incompatibles: Water, most common metals, combustible materials, organic materials
Decomposition Products: Hydrogen Chloride

HEALTH HAZARD DATA

Inhalation: Severe irritation of respiratory system
Skin Contact: Severe irritation or burns

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Eye Contact: Severe irritation or burns
Skin Absorption: None identified
Ingestion: Severe burns to mouth, throat, and stomach
Chronic Effects: None Identified
Threshold Limit Value (TLV/TWA): 2 mg/m³
TLV Is For Aluminum, Soluble Salts, As Al.
Short-Term Exposure Limit (STEL): Not Established
Permissible Exposure Limit (PEL): 2 mg/m³
PEL Is For Aluminum, Soluble Salts, As Al.
Toxicity Of Components:
Oral Mouse LD₅₀ For Aluminum Chloride 770 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Eyes, skin, mucous membranes, gi tract
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store away from water or locations where water may be used to extinguish fire. Do not store in direct sunlight. Isolate from incompatible materials.

Special Precautions: Material is hygroscopic.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Do not use water. With clean shovel, place material into clean, dry container and cover. Move container(s) from spill area.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BARIUM NITRATE****0104****PRODUCT INFORMATION**

Product Name: Barium Nitrate

Chinese Name: 硝(V)酸鋇

Common Synonyms: Barium (II) Nitrate; Barium Dinitrate; Nitric Acid, Barium Salt

Chemical Family: Barium Compounds

Formula: $\text{Ba}(\text{NO}_3)_2$

Formula Wt.: 261.35

CAS No.: 10022-31-8

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 592 deg. C (1097 deg. F) Vapor Density (Air=1): 9.0
(@ 760 mmHg)
Specific Gravity: 3.24 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Moderate (1-10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystalline powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion.

Toxic Gases Produced: Oxides Of Nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition
Incompatibles: Combustible materials, strong reducing agents
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation: Irritation of nose and throat

Skin Contact: None identified

Eye Contact: May cause irritation

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects:

Irritation of respiratory system, central nervous system damage, damage to spleen, liver, bone marrow

Threshold Limit Value (TLV/TWA): 0.5 mg/m³

TLV Is For Barium, Soluble Compounds, As Ba.

Short-Term Exposure Limit (STEL): Not Established

Permissible Exposure Limit (PEL): 0.5 mg/m³

PEL Is For Barium, Soluble Compounds, As Ba.

Toxicity Of Components:

Oral Rat LD₅₀ For Barium Nitrate

355 mg/kg

Intravenous Mouse LD₅₀ For Barium Nitrate

8.5 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BENZALDEHYDE****0105****PRODUCT INFORMATION**

Product Name: Benzaldehyde

Chinese Name: 苯<甲>醛

Common Names/Synonyms: Artificial Oil Of Almond

CAS No.: 100-52-7

Formula: C₇H₆O**RISK SYMBOL****PHYSICAL DATA**

Boiling Point : 354 deg. F

Vapor Pressure, mmHg/20 deg. C: <1

Melting Point : -15 deg. F

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Vapor Density (Air=1): 3.66
Specific Gravity (Water=1): 1.046
Water Solubility, %: Slight
Evaporation Rate (Butyl Acetate=1): <1 Less
Appearance And Odor: Colorless to light yellow liquid with an odor bitter almond.

FIRE AND EXPLOSION DATA

Flash Point : 148 deg. F
Flammable Limits In Air, % Lower: N/D Upper: N/D
Method Used: TCC:
Extinguishing Media : Use water spray, dry chemical, CO₂, or alcohol foam.
Special Fire Fighting Procedures:
Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards: Extinguish all nearby sources of ignition.

REACTIVITY DATA

Stability: Stable
Polymerization: Will not occur
Conditions To Avoid: Heat, sparks, and open flames.
Materials To Avoid: Oxidizers, copper and brass.
Hazardous Decomposition Products:
May liberate carbon monoxide or carbon dioxide and potentially toxic and/or poisonous vapors.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact, inhalation.
Inhalation: Vapors and mists irritate the nose and throat. Maybe narcotic.
Eye Contact: Liquid and mist may irritate the eyes.
Skin Contact: No irritation is likely after brief contact but may be irritating after prolonged contact.
Swallowed: None currently known.
Chronic Effects Of Exposure: No specific information available.
Medical Conditions Generally Aggravated By Exposure: None reported.
Oral: Rats LD₅₀ = 1300 mg/kg

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed: Do not Induce Vomiting. Get Immediate Medical Attention.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing emissions at the point of use.

Respiratory Protection:

Wear a NIOSH-approved respirator appropriate for the vapor or mist concentration at the point of use. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator equipped for organic vapors/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles and full faceshield unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, rubber boots, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and read for use.

Handling And Storage Precautions:

Keep away from heat, sparks, and flames. Store in a cool, dry, well-ventilated place away from incompatible materials. Vent container frequently, and more often in warm weather, to relieve pressure. Electrically ground all equipment when handling this product and use only non-sparking tools. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Additional Precautions:

Benzaldehyde has a low autoignition temperature and can be ignited by for example, exposed low pressure steam pipes. It may also spontaneously ignite when soaked in rags or absorbed into activated carbon.

Bulk storage of benzaldehyde should be made under a nitrogen blanket, since benzaldehyde is easily oxidized to benzoic acid on exposure to air. All storage tank openings should be easily accessible for cleaning, since they will have a tendency to plug with this benzoic acid.

Store as a NFPA class IIIA liquid. Keep fire and sparks away from drums. Since empty containers retain product residue, do not cut, drill, grind, or weld on or near the container until it is thoroughly cleaned.

Rags and activated carbon saturated with benzaldehyde may ignite spontaneously. Clean both thoroughly to remove benzaldehyde before discarding.

Isolate, vent, drain, wash and purge systems or equipment before maintenance or repair. Remove all ignition sources. Check atmosphere for explosiveness and oxygen deficiencies. Use adequate personal protective equipment. Comply with regulations governing confined space entry.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapors. Always obey hazard warnings and handle empty containers as if they were full.

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ENVIRONMENTAL PROTECTION DATA

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Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped for organic vapors may be satisfactory. In any event, always wear eye protection. For small spills or drips, mop or wipe up and dispose of in dot-approved waste containers. For large spills, contain by diking with soil or other non-combustible sorbent material and then pump into DOT-approved waste containers; or absorb with non-combustible sorbent material, place residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soils. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

City University of Hong Kong

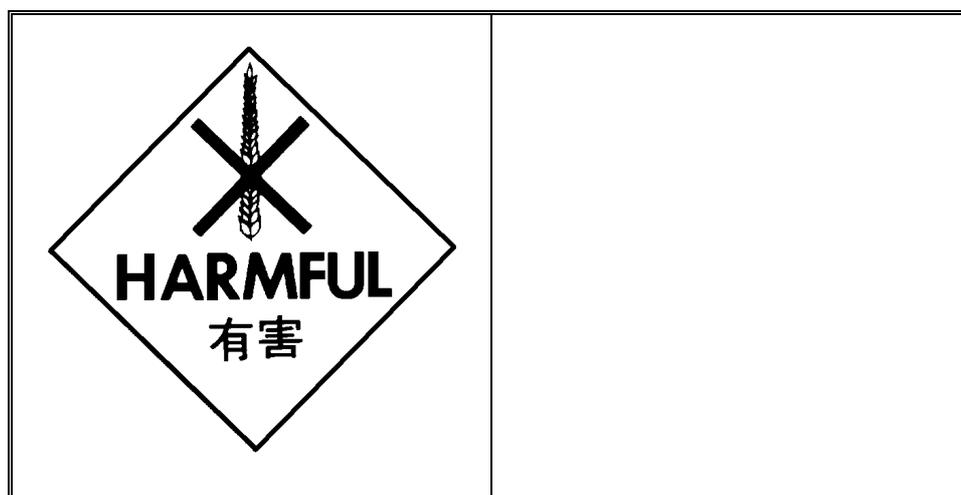
MSDS**CATECHOL****0106****PRODUCT INFORMATION**

Product Name: Catechol

Chinese Name: 兒茶酚, 鄰苯二酚

Common Names/Synonyms: O-Dihydroxybenzene; Pyrocatechol

CAS No.: 120-80-9

Formula: C₆H₆O₂**RISK SYMBOL****PHYSICAL DATA**

Boiling Point : 474 deg. F

Vapor Pressure, mmHg/20 deg. C: 10

Melting Point : 221 deg. F

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Vapor Density (Air=1): 3.79
Specific Gravity (Water=1): 1.344
Water Solubility, %: 45
Evaporation Rate (Butyl Acetate=1): <1
Appearance And Odor: Colourless crystals

FIRE AND EXPLOSION DATA

Flash Point : 260 deg. F
Flammable Limits In Air, % Lower: N/D Upper: N/D
Method Used: CC
Extinguishing Media: Use water spray, dry chemical, CO₂, or alcohol foam.
Special Fire Fighting Procedures:
Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards: Extinguish all nearby sources of ignition.

REACTIVITY DATA

Stability: Stable
Polymerization: Will Not Occur
Conditions To Avoid: Heat, sparks, open flames, light, and air.
Materials To Avoid: Acids, oxidizing materials.
Hazardous Decomposition Products: May liberate carbon monoxide and carbon dioxide.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact, inhalation.
Inhalation:
Dusts are extremely corrosive to the entire respiratory tract. Breathing dust can destroy the mucous membranes and can cause severe pneumonitis.
Eye Contact: Dusts will irritate the eyes and prolonged contact may burn and damage the eyes.
Skin Contact:
Brief contact may dry the skin. Prolonged or repeated contact may irritate the skin, causing dermatitis.
Swallowed: Convulsion, collapse, and death.
Chronic Effects Of Exposure: No specific information available.
Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Rat LD₅₀ = 3.89 g/kg
Dermal: Rabbit LD₅₀ = 800 mg/kg

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation resists after washing.

If Swallowed: Do not induce vomiting. Get immediate medical attention.

PREVENTATIVE MEASURES

Ventilation: General room ventilation.

Respiratory Protection:

Respirator is normally not required if this product is used with adequate ventilation.

Eye Protection:

Safety glasses with side shields. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures:

An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags or fiber drums dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapors. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped with particulate filters may be satisfactory. In any event, always wear eye protection. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil. Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BENZOYL CHLORIDE****0109****PRODUCT INFORMATION**

Product Name: Benzoyl Chloride

Chinese Name: 氯化苄基

Common Synonyms:

Benzoic Acid, Chloride; A-Chlorobenzaldehyde; Benzenecarbonyl Chloride

Chemical Family: Acid Chlorides

Formula: C_6H_5COCl

Formula Wt.: 140.57

CAS No.: 98-88-4

Product Use: Laboratory Reagent

RISK SYMBOL

PHYSICAL DATA

Physical State: Liquid

Boiling Point: 197 deg. C (386 deg. F)
(@ 760 mmHg)

Vapor Pressure (mmHg): 1.0
(20 deg. C)

Melting Point: -1 deg. C (30 deg. F)
(@ 760 mmHg)

Vapor Density (Air=1): 4.88

Specific Gravity: 1.21
(H₂O=1)

Evaporation Rate: N/A

Solubility(H₂O): Decomposes

% Volatiles By Volume: N/A
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: Clear, colorless fuming liquid. Penetrating odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 72 deg. C (162 deg. F)

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use dry chemical or carbon dioxide. Do not use water.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained Breathing apparatus with full facepiece operated in positive pressure mode. Move exposed containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool; do not get water inside containers.

Unusual Fire & Explosion Hazards:

Reacts violently with water producing highly toxic fumes. Contact with strong oxidizers may cause fire or explosion. Closed containers exposed to heat may explode.

Toxic Gases Produced: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Moisture, heat, flame

Incompatibles: Strong oxidizing agents, water, alcohols, strong bases

Decomposition Products: Phosgene, carbon monoxide, carbon dioxide, hydrogen chloride

HEALTH HAZARD DATA

Inhalation:

Is harmful may be fatal, severe irritation or burns of respiratory system, pulmonary edema, lung inflammation

Skin Contact: Severe irritation or burns

Eye Contact: Severe irritation or burns

Skin Absorption: None identified

Ingestion: Irritation and burns to mouth and stomach

Chronic Effects: Central nervous system depression

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, lungs, eyes, skin, central nervous system

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a chemical cartridge respirator with acid/ organic cartridge is recommended. If concentration exceeds capacity of cartridge respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store away from water or locations where water may be used to extinguish fire. Store in a cool, well-ventilated area away from sources of heat, flame, or ignition. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking, or flames in area. Stop leak if you can do so without risk. Neutralize spill with soda ash or lime. With clean shovel, carefully place material into clean, dry container and cover. Remove from spill area. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

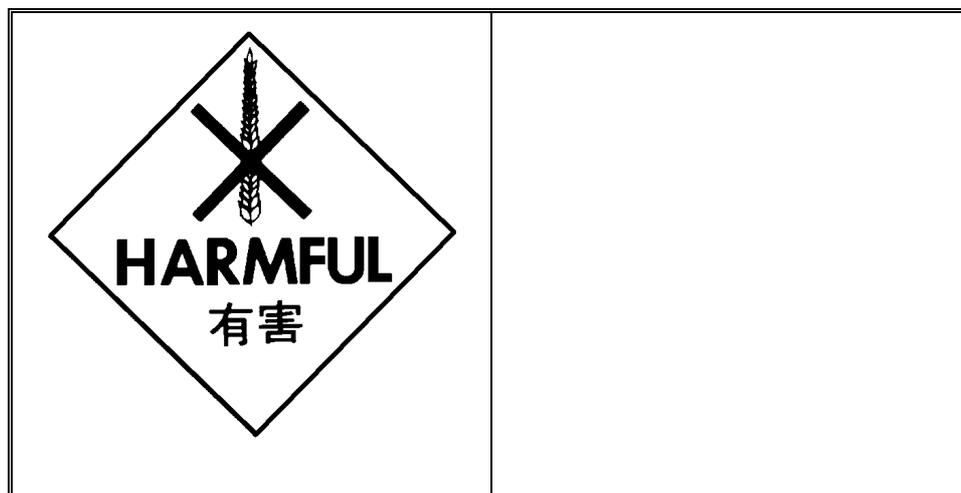
MSDS**BENZYL ALCOHOL****0110****PRODUCT INFORMATION**

Product Name: Benzyl Alcohol

Chinese Name: 苯甲醇

Common Names/Synonyms: Phenyl Carbinol; Alpha-Hydroxytoluene, Benzyl Alcohol USP/NF

CAS No.: 100-51-6

Formula: C₇H₈O**RISK SYMBOL****PHYSICAL DATA**

Boiling Point : 401 deg. F

Vapor Pressure, mmHg/20 deg. C: 0.1

Melting Point : 5 deg. F

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Vapor Density (Air=1): 3.72
Specific Gravity (Water=1): 1.04-1.05
Water Solubility, %: (1-10) Moderate
Evaporation Rate (Butyl Acetate=1): None
Appearance And Odor: Clear colorless liquid; pleasant aromatic odor

FIRE AND EXPLOSION DATA

Flash Point : 213 deg. F
Flammable Limits In Air, % Lower: None Upper: None
Method Used: TCC
Extinguishing Media: Use water spray, dry chemical or CO₂. Do not use a direct water stream.
Special Fire Fighting Procedures:
Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Extinguish all nearby sources of ignition since vapors decompose to toxic products at high temperatures. When exposed to heat, closed containers may explode. Contact with strong oxidizers may cause fire or explosion.

REACTIVITY DATA

Stability:

Stable at ambient conditions. Undergoes slow oxidation to benzaldehyde in presence of oxygen.

Polymerization: Will not occur conditions to avoid: heat, sparks, and open flames.

Materials To Avoid:

Acids, oxidizing materials, plastics other than teflon or polypropylene, and aluminum at high temperatures.

Hazardous Decomposition Products: Liberate carbon monoxide or carbon dioxide.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Inhalation and skin absorption signs and symptoms of exposure

Inhalation:

Inhalation of vapors may produce respiratory irritation, coughing and difficulty in breathing. Overexposure may cause narcosis, central nervous system depression, dizziness, drowsiness, unconsciousness and pulmonary edema.

Eye Contact: Vapors will irritate the eyes. Liquid and mists will irritate and may burn the eyes.

Skin Contact:

No irritation is likely after brief contact but may be irritating after prolonged contact. May be absorbed through skin.

Swallowed:

Swallowing large quantities may cause nausea, vomiting, and abdominal pain. overexposure may cause central nervous system depression and unconsciousness.

Chronic Effects Of Exposure: No specific information available.

Medical Conditions Generally Aggravated By Exposure:

Pre-existing lung disease may be aggravated by exposure to product.

Oral: Rat LD₅₀=1.23 g/kg

Dermal: Rabbit LD₅₀=2.0 g/kg

Inhalation: Rat LC₅₀=1000 ppm/8h

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

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FIRST AID MEASURES
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If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 15 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing emissions at the point of use.

Respiratory Protection:

If use conditions generate vapors or mists, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece air-purifying cartridge respirator equipped for organic vapors/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, neo-prene gloves, and neoprene apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapors. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped for organic vapors may be satisfactory. In any event, always wear eye protection. For small spills or drips, mop or wipe up and dispose of in dot-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent material, and then pump into DOT-approved waste containers; or absorb with non-combustible sorbent material, place residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soils.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BENZYL CHLORIDE****0111****PRODUCT INFORMATION**

Product Name: Benzyl Chloride

Chinese Name: 苯甲基氯

Common Synonyms: Alpha-Chlorotoluene; Chloromethylbenzene

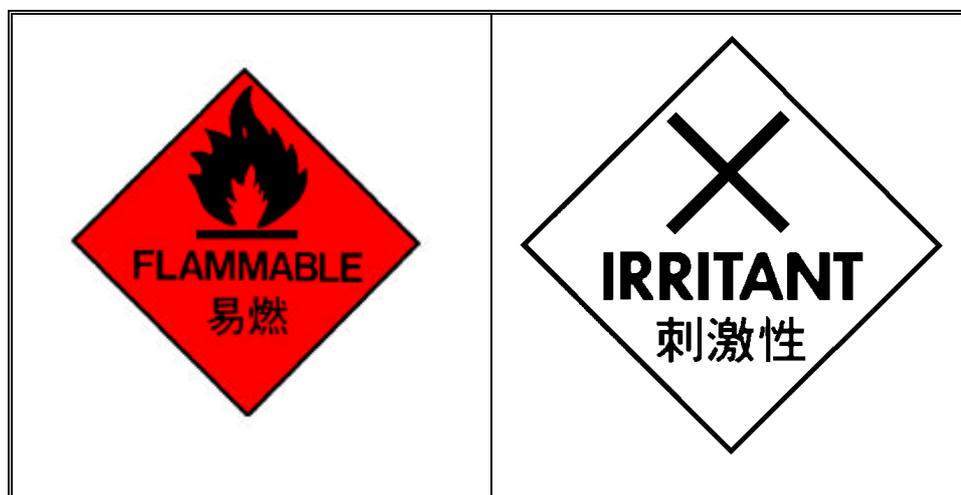
Chemical Family: Chlorinated Hydrocarbons

Formula: $C_6H_5CH_2Cl$

Formula Wt.: 126.59

CAS No.: 100-44-7

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

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Physical State: Liquid
Boiling Point: 179 deg. C (354 deg. F) Vapor Pressure (mmHg): 1
(@ 760 mmHg) (20 deg. C)
Melting Point: -45 deg. C (-49 deg. F) Vapor Density (Air=1): 4.4
(@ 760 mmHg)
Specific Gravity: 1.10 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless liquid. Irritating odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 67 deg. C (153 deg. F)
Autoignition Temperature: 584 deg. C (1085 deg. F)
Flammable Limits: Upper - N/A Lower - 1.1 %
Fire Extinguishing Media: Use dry chemical or carbon dioxide. Do not use water.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:

Vapors may flow along surfaces to distant ignition sources and flash back. closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire. Benzyl chloride reacts with most metals liberating heat and hydrogen chloride, which also may cause closed containers to explode.

Toxic Gases Produced: Hydrogen chloride, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Unstable

Hazardous Polymerization: May occur

Conditions To Avoid: Heat, flame, other sources of ignition, moisture, light

Incompatibles: Most common metals, strong oxidizing agents, strong acids, water

Decomposition Products: Hydrogen chloride, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation:

Severe irritation or burns, severe irritation or burns of respiratory system, pulmonary edema, lung inflammation

Skin Contact: Severe irritation or burns

Eye Contact: Severe irritation or burns, permanent eye damage

Skin Absorption: None identified

Ingestion:

Headache, nausea, vomiting, dizziness, gastrointestinal irritation, central nervous system depression

Chronic Effects: Kidney damage, liver damage

Threshold Limit Value (TLV/TWA): 5 mg/m³ (1 ppm)

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 5 mg/m³ (1 ppm)

Toxicity Of Components:

Oral Rat LD₅₀ For Benzyl Chloride

1231 mg/kg

Subcutaneous Rat LD₅₀ For Benzyl Chloride

1 mg/kg

Inhalation-2hr RAT LC₅₀ For Benzyl Chloride

150 ppm

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: This substance is anticipated to be a carcinogen.

Reproductive Effects: None identified.

Target Organs: Eyes, respiratory system, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 10 ppm, a chemical cartridge respirator with acid/organic cartridge is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area or cabinet. Store in light-resistant containers.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

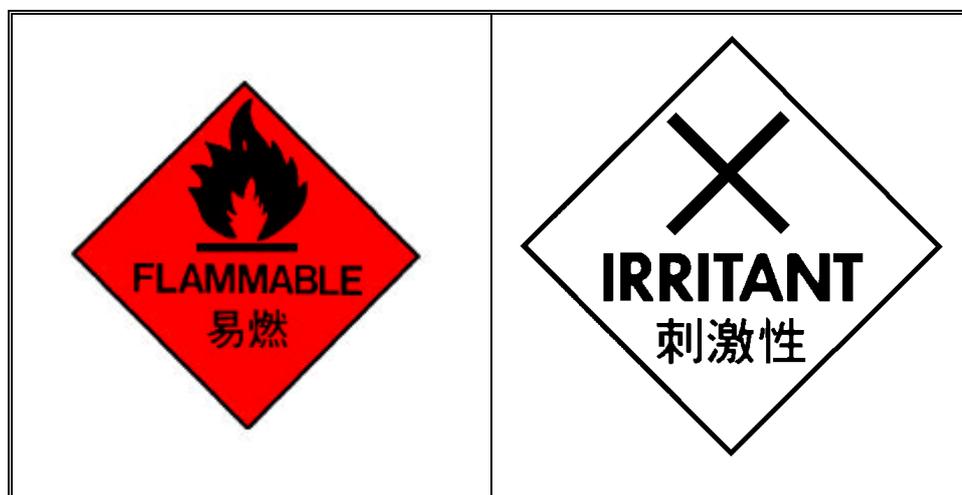
Wear suitable protective clothing. Shut off ignition sources; no flares, smoking, or flames in area. Stop leak if you can do so without risk. Do not use water. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**1-BROMOBUTANE****0112****PRODUCT INFORMATION**

Product Name: 1-Bromobutane
Chinese Name: 1-溴丁烷
Common Synonyms: N-Butyl Bromide
Chemical Family: Brominated Hydrocarbons
Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$
Formula Wt.: 137.02
CAS No.: 109-65-9
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Liquid
Boiling Point: 102 deg. C (215 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: -112 deg. C (-169 deg. F) Vapor Density (Air=1): 4.7
(@ 760 mmHg)
Specific Gravity: 1.27 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless liquid.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 18 deg. C (65 deg. F)
Autoignition Temperature: 264 deg. C (509 deg. F)
Flammable Limits: Upper - 6.6 % Lower - 2.6 %
Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards:
Vapors may flow along surfaces to distant ignition sources and flash back. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

Toxic Gases Produced: Hydrogen bromide, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, sources of ignition
Incompatibles: Strong oxidizing agents, strong bases
Decomposition Products: Hydrogen bromide, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Coughing, chest pains, difficult breathing, unconsciousness

Skin Contact: Burns

Eye Contact: Burns

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Intraperitoneal Rat LD₅₀ For 1-Bromobutane

4450 mg/kg

Intraperitoneal Mouse LD₅₀ For 1-Bromobutane

6680 mg/kg

Inhalation-30min Rat LC₅₀ For 1-Bromobutane

237 g/m³

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Skin, eyes

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a chemical cartridge respirator with organic vapor cartridge is recommended. If concentration exceeds capacity of cartridge respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**2-BROMOBUTANE****0113****PRODUCT INFORMATION**

Product Name: 2-Bromobutane

Chinese Name: 2-溴丁烷

Common Synonyms: Sec-Butyl Bromide; Methylenebromomethane

Chemical Family: Brominated Hydrocarbons

Formula: $\text{CH}_3\text{CHBrCH}_2\text{CH}_3$

Formula Wt.: 137.02

CAS No.: 78-76-2

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: 90 deg. C (194 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: -112 deg. C (-169 deg. F) Vapor Density (Air=1): 4.7
(@ 760 mmHg)
Specific Gravity: 1.26 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Clear, colorless liquid. Pleasant odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 21 deg. C (70 deg. F)
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media:
Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:

Vapors may flow along surfaces to distant ignition sources and flash back. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

Toxic Gases Produced: Hydrogen Bromide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, sources of ignition
Incompatibles: Strong oxidizing agents
Decomposition Products: Hydrogen bromide

HEALTH HAZARD DATA

Inhalation:

Coughing, difficult breathing, headache, nausea, dizziness, fatigue, weakness in arms and legs

Skin Contact: Burns

Eye Contact: Burns

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a chemical cartridge respirator with organic vapor cartridge is recommended. If concentration exceeds capacity of cartridge respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS 2-BROMO-2-METHYLPROPANE 0114**PRODUCT INFORMATION**

Product Name: 2-Bromo-2-Methylpropane
Chinese Name: 2-溴-2-甲基丙烷, 2-甲基-2-溴丙烷
Common Synonyms: Tert-Butyl Bromide; 2-Bromoisobutane; Trimethylbromomethane
Chemical Family: Brominated Hydrocarbons
Formula: $(\text{CH}_3)_3\text{CBr}$
Formula Wt.: 137.02
CAS No.: 507-19-7
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: 72 deg. C (161 deg. F) (@ 760 mmHg) Vapor Pressure (mmHg): N/A
Melting Point: -16 deg. C (3 deg. F) (@ 760 mmHg) Vapor Density (Air=1): >1.0
Specific Gravity: 1.26 (H₂O=1) Evaporation Rate: N/A
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100 (21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless liquid.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 16 deg. C (61 deg. F)
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray, alcohol foam, dry chemical or carbon dioxide.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards:
Vapors may flow along surfaces to distant ignition sources and flash back. closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

Toxic Gases Produced: Hydrogen bromide, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, sources of ignition
Incompatibles: Strong oxidizing agents
Decomposition Products: Hydrogen bromide, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact: In case of contact, flush skin with water.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a chemical cartridge respirator with organic vapor cartridge is recommended. If concentration exceeds capacity of cartridge respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions: Bond and ground containers when transferring liquid.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**1-BUTANOL****0115****PRODUCT INFORMATION**

Product Name: 1-Butanol
Chinese Name: 丁-1-醇
Common Synonyms: Butyl Alcohol; N-Butyl Alcohol
Chemical Family: Alcohols
Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
Formula Wt.: 74.12
CAS No.: 71-36-3
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: 118 deg. C (244 deg. F) Vapor Pressure (mmHg): 4
(@ 760 mmHg) (20 deg. C)
Melting Point: -89 deg. C (-128 deg. F) Vapor Density (Air=1): 2.6
(@ 760 mmHg)
Specific Gravity: 0.81 Evaporation Rate: 0.46
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): Moderate (1-10%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless liquid. Alcohol odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 34 deg. C (95 deg. F)
Autoignition Temperature: 342 deg. C (650 deg. F)
Flammable Limits: Upper - 11.2 % Lower - 1.4 %
Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:

Vapors may flow along surfaces to distant ignition sources and flash back. closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Heat, flame, other sources of ignition

Incompatibles: Strong oxidizing agents, alkali metals, strong acids, halogen acids, aluminum, aldehydes

Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation:

Irritation and drying of mucous membranes, headache, nausea, vomiting, dizziness, narcosis, respiratory failure, low blood pressure, central nervous system depression, unconsciousness

Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation, may cause temporary corneal damage

Skin Absorption: None identified

Ingestion:

Headache, nausea, vomiting, dizziness, gastrointestinal irritation, central nervous system depression, hearing loss, unconsciousness

Chronic Effects: Kidney damage, liver damage

Threshold Limit Value (TLV/TWA): 150 mg/m³ (50 ppm)

TLV (Skin) Listed Denotes Ceiling Limit.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 150 mg/m³ (50 ppm)

PEL (Skin) Listed Denotes Ceiling Limit.

Toxicity Of Components:

Oral Rat LD ₅₀ For 1-Butanol	790 mg/kg
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Skin Rabbit LD ₅₀ For 1-Butanol	4200 mg/kg
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Intravenous Mouse LD ₅₀ For 1-Butanol	377 mg/kg
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Inhalation-4hr Rat LC ₅₀ For 1-Butanol	8000 ppm
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Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Skin, eyes, respiratory system, kidneys, liver

Medical Conditions Generally Aggravated By Exposure:

Eye disorders, skin disorders, respiratory system disease

Primary Routes Of Entry: Ingestion, inhalation, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 1000 ppm, a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection: Safety goggles, uniform, apron, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions:

Bond and ground containers when transferring liquid. Product may solidify at room temperature.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**2-BUTANOL****0116****PRODUCT INFORMATION**

CHEMICAL NAME : 2-Butanol
Chinese Name: 丁-2-醇
SYNONYMS : Sec-Butyl Alcohol
Chemical Family : Alcohol
Molecular Weight : 74.12
Formula : $C_4H_{10}O$
CAS no. : 78-92-2

RISK SYMBOL**PHYSICAL DATA**

Boiling Point, 760mm Hg : 99.6 deg. C

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Vapor Pressure At 20 deg. C : 12 mm Hg
% Volatiles By Volume : Ca 100
Freezing Point : -114.7 deg. C
Vapor Density (Air=1) : 2.55
Specific Gravity (H₂O=1) : @ 20 deg. C 0.807
Evaporation Rate : (BuAc=1) Ca 1
Solubility In Water : @ 20 deg. C 12.5%
Stability : Stable
Hazardous Polymerization : Not expected to occur.
Appearance And Odor : Clear, colorless liquid with a strong, sweet odor.

FIRE AND EXPLOSION DATA

Flash Point, (Test Method) : 23.9 deg. C (Tag closed cup)
Auto Ignition Temperature : 405 deg. C
Flammable Limits In Air % By Volume : Lower Limit 1.7 Upper Limit 9.8
Unusual Fire And Explosion Hazards : Volatile and flammable.
Extinguishing Media : Carbon dioxide, dry chemical, or alcohol foam.
Special Fire Fighting Procedures :
Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers. Keep fire- exposed containers cool with water spray.

REACTIVITY DATA

Conditions To Avoid : Heat, sparks, open flame, open containers, and poor ventilation.
Materials To Avoid : Strong oxidizing agents and strong acids and bases.

Hazardous Decomposition Products :
Incomplete combustion can generate carbon monoxide and other toxic vapors.

HEALTH HAZARD DATA

Inhalation:
Exposure can cause irritation to the respiratory tract, dizziness, headache, nausea, and narcosis.

Eye Contact:
Liquid and high vapor concentration can be very irritating, and can cause conjunctivitis and corneal burns.

Skin Contact:

Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin.

Ingestion: Can cause gastrointestinal tract discomfort.

Occupational Exposure Limits

OSHA 8-hour PEL - 150 ppm

ACGIH TLV-TWA - 100 ppm

TLV-STEL - 150 ppm
(15-min)

Concentration Immediately Dangerous to Health

OSHA/NIOSH 8-hour PEL - 10,000 ppm

NSC & OHS TLV-TWA - 20 ppm

NIOSH TLV-STEL - 43 ppm
(15-min)

Primary Routes of Entry :

2-Butanol may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Effects of Overexposure :

2-Butanol is an eye and mucous membrane irritant, primary skin irritant, and central nervous depressant. Acute exposure causes irritation, narcosis, and gastrointestinal tract irritation.

Medical Condition Aggravated by Exposure :

Preclude from exposure those individuals susceptible to dermatitis.

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FIRST AID MEASURES
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Inhalation:

Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact:

Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact:

Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion:

Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

PREVENTATIVE MEASURES

Ventilation:

Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory:

Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes:

Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin:

Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, Buna-N or neoprene offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to 2-butanol may require additional protective equipment.

Storage:

2-Butanol should be protected from temperature extremes and direct sunlight. Proper storage of 2-butanol must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, 2-butanol should be stored in an acceptably protected and secure flammable liquid storage room.

Other:

Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

ENVIRONMENTAL PROTECTION DATA

Spill Control:

Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SUCCINIC ACID****0117****PRODUCT INFORMATION**

Product Name: Succinic Acid
Chinese Name: 琥珀酸
Common Synonyms: Butanedionic Acid; Amber Acid
Chemical Family: Organic Acids
Formula: $\text{HOOCCH}_2\text{CH}_2\text{COOH}$
Formula Wt.: 118.09
CAS No.: 110-15-6
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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Physical State: Solid
Boiling Point: 235 deg. C (455 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 185 deg. C (365 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 1.56 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: 2.7 (0.1M Solution)
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures: None identified.
Unusual Fire & Explosion Hazards:
Can be an explosion hazard, especially when heated. Contact with strong oxidizers may cause fire or explosion.

Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None identified
Incompatibles: Strong oxidizing agents, strong bases
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified

Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in corrosion-proof area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

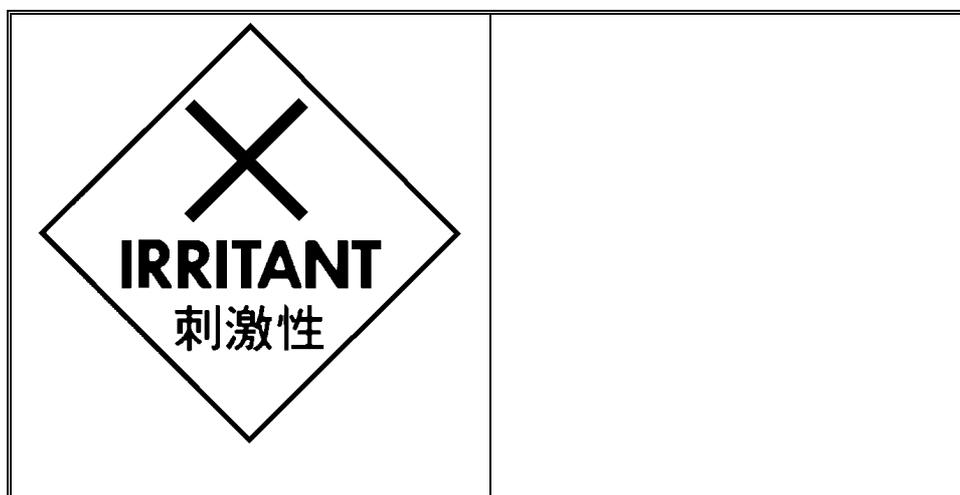
Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CALCIUM HYDROXIDE****0118****PRODUCT INFORMATION**

Product Name: Calcium Hydroxide
Chinese Name: 氫氧化鈣
Common Synonyms: Calcium Hydrate; Slaked Lime
Chemical Family: Calcium Compounds
Formula: Ca(OH)_2
Formula Wt.: 74.09
CAS No.: 1305-62-0
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 580 deg. C (1076 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 2.3 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals or powder. odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures:
Firefighters should wear self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Air, dusting
Incompatibles: Strong acids, nitromethane, nitroethane, nitropropane, phosphorus, maleic anhydride
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Severe irritation or burns, prolonged contact may cause dermatitis
Eye Contact: Severe irritation or burns

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Skin Absorption: None identified

Ingestion: Irritation and burns to mouth and stomach, nausea, vomiting, diarrhea

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 5 mg/m³

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 5 mg/m³

Toxicity Of Components:

Oral Rat LD₅₀ For Calcium Hydroxide 7340 mg/kg

Oral Mouse LD₅₀ For Calcium Hydroxide 7300 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin

Medical Conditions Generally Aggravated By Exposure: Chronic respiratory disease, skin disorders

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Isolate from incompatible materials.

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ENVIRONMENTAL PROTECTION DATA

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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CHLOROBENZENE****0119****PRODUCT INFORMATION**

Product Name: Chlorobenzene

Chinese Name: 氯苯

Common Synonyms: Monochlorobenzene; Benzene Chloride; Chlorobenzol; Phenyl Chloride

Chemical Family: Chlorinated Hydrocarbons

Formula: C_6H_5Cl

Formula Wt.: 112.56

CAS NO.: 108-90-7

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: 132 deg. C (269 deg. F)
(@ 760 mmHg) Vapor Pressure (mmHg): 11.8
(20 deg. C)
Melting Point: -45 deg. C (-49 deg. F)
(@ 760 mmHg) Vapor Density (Air=1): 3.9
Specific Gravity: 1.11
(H₂O=1) Evaporation Rate: 1.07
(Butyl Acetate = 1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Clear, colorless liquid. almond odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 28 deg. C (84 deg. F)
Autoignition Temperature: 592 deg. C (1099 deg. F)
Flammable Limits: Upper - 7.1 % Lower - 1.3 %
Fire Extinguishing Media:
Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:

Vapors may flow along surfaces to distant ignition sources and flash back. closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

Toxic Gases Produced:

Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Heat, flame, other sources of ignition

Incompatibles: Strong oxidizing agents

Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation:

Headache, nausea, vomiting, dizziness, drowsiness, irritation of upper respiratory tract, unconsciousness

Skin Contact: Severe irritation or burns, prolonged contact may cause dermatitis

Eye Contact: Severe irritation or burns

Skin Absorption: None identified

Chronic Effects: Damage to liver, kidneys, lungs, blood, central nervous system

Ingestion: Headache, nausea, vomiting, dizziness, gastrointestinal irritation

Threshold Limit Value (TLV/TWA): 350 mg/m^3 (75 ppm)

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 350 mg/m^3 (75 ppm)

Toxicity Of Components:

Oral Rat LD₅₀ For Chlorobenzene

2910 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs:

Respiratory system, lungs, eyes, skin, central nervous system, liver, kidneys, blood

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 1000 ppm, a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, viton gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CRUDE OIL****0120**

PRODUCT INFORMATION

Trade Name: Crude Oil

Chinese Name: 石油

Synonym(S): Crude Oil; Rock Oil; Seneca Oil; Process Stream

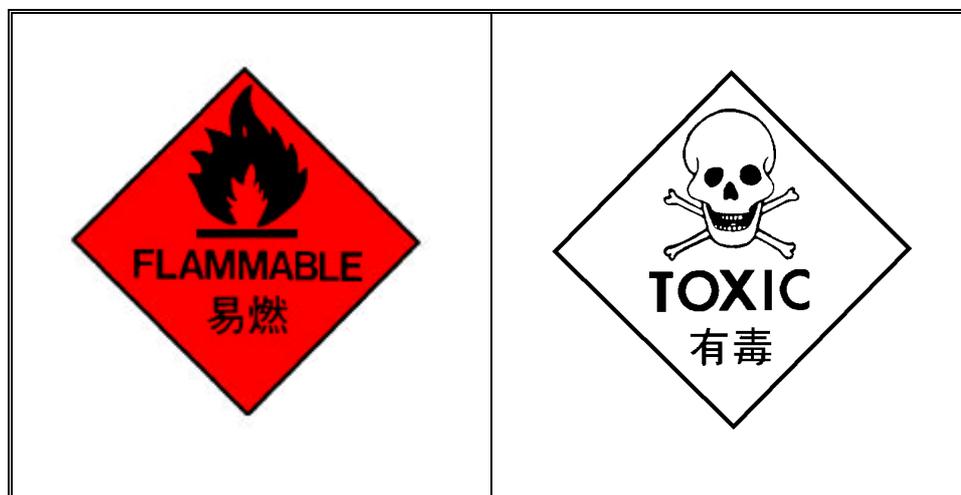
Chemical Family: Hydrocarbon

CAS Number: 8002-05-9

Molecular Formula: Mixture

Molecular Weight: ND

RISK SYMBOL



PHYSICAL DATA

Boiling Point: -17.8 - 537.8 deg. C (0-1000 deg. F)

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Specific Gravity: 0.74 - 1.03
Melting Point: Na
% Volatile: Varies
Vapor Pressure: 0.6 - 10 Lbs. (Reid)
Evaporation Rate (Water=1): ND
Vapor Density (Air=1): > 1
Viscosity: Varies
% Solubility In Water: Negligible
Octanol/Water Partition Coefficient:
Pour Point: Varies
pH: ND
Appearance/Odor: Dark brown/black oil with hydrocarbon/hydrogen sulfide odor.

FIRE AND EXPLOSION DATA

Flash Point: -42.800 - 93.300 deg. C (-45 - >200 deg. F)

Note: Dependent on crude oil type

Autoignition Temperature: Nd

Flammability Limits In Air (% By Vol.) Lower: ND

Flammability Limits In Air (% By Vol.) Upper: ND

Basic Fire Fighting Procedures:

Use dry chemical, foam or carbon dioxide to extinguish fire. Water may be ineffective but should be used to cool fire-exposed containers, structures and to protect personnel. If leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop leak. Use water to flush spills away from sources of ignition. Do not flush down public sewers or other drainage systems.

Unusual Fire And Explosion Hazards:

Dangerous when exposed to heat or flame. Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back. Vapors may concentrate in confined areas. Containers may explode in heat of fire. Runoff to sewer may cause fire or explosion hazard. Irritating or toxic substances may be emitted upon thermal decomposition. Exposed firefighters must wear MSHA/NIOSH approved self-contained breathing apparatus with full face mask and full protective equipment.

REACTIVITY DATA

Stability/Incompatibility:

Stable under conditions of normal use. Avoid contact with strong oxidizers.

Hazardous Reactions/Decomposition Products:

Irritating and toxic fumes may be emitted upon decomposition. Combustion may produce CO, CO₂ and reactive hydrocarbons. May also produce SO_x and hydrogen sulfide. Hydrogen sulfide is corrosive to many materials when moist.

HEALTH HAZARD DATA

Ingestion:

Aspiration into lungs may cause pneumonitis. May cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

Skin:

Repeated or prolonged contact may result in defatting, oil acne, redness, itching, inflammation, cracking and possible secondary infection. Absorption from prolonged or massive skin contact may cause poisoning. May cause allergic reactions in some individuals.

Eye: Direct contact may cause irritation. Exposure to vapors, fumes or mists may cause irritation.

Inhalation:

May cause respiratory tract irritation. Exposure to high concentrations of dense oil mists may lead to oil pneumonia. May release toxic hydrogen sulfide vapors and cause harmful central nervous system effects. Effects may include excitation, euphoria, headache, dizziness, drowsiness, blurred vision, fatigue, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death.

Special Toxic Effects:

Crude oils contain some polynuclear aromatic hydrocarbons which have been shown to be carcinogenic after prolonged or repeated skin contact in laboratory animals. Some crude oils have been shown to cause skin cancer in laboratory animals and crude oil fractions have been positive in mutagenic test systems. Toxic hydrogen sulfide vapors may be released from crude oils. In addition, the presence of various heavy metals in crude oils may pose a bioaccumulation potential which could lead to systemic toxicity by repeated or prolonged inhalation, ingestion or skin absorption.

This product contains Benzene. Acute benzene poisoning causes central nervous system depression. Chronic exposure affects the haematopoietic system causing blood disorders including anemia and pancytopenia. Mutagenic and clastogenic in mammalian and non-mammalian test systems. Reproductive toxicant only at doses that are maternally toxic, based on tests with animals. Benzene is carcinogenic to laboratory animals when given by intubation or by inhalation. There is an association between occupational exposure to benzene and human leukemia.

FIRST AID MEASURES

Ingestion:

Do not induce vomiting because of danger of aspirating liquid into lungs. If spontaneous vomiting occurs, monitor for breathing difficulty. Get immediate medical attention.

Skin Contact:

Remove contaminated clothing immediately. Wash area of contact thoroughly with soap and water. Do not use petroleum-based solvents to remove oil from skin. Get medical attention if irritation persists. Launder clothing before reuse. Discard contaminated leather goods.

Eye Contact:

Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get medical attention if irritation persists.

Inhalation:

Remove affected person from source of exposure. If not breathing, ensure clear airway and institute cardiopulmonary resuscitation (CPR). If breathing is difficult, administer oxygen if available. Get immediate medical attention.

Notes To Physician :

Aspiration of petroleum hydrocarbons may cause severe pneumonitis (oil pneumonia). Vomiting should not be induced. In unconscious victims, use of an endotracheal tube should be considered if gastric lavage is undertaken.

PREVENTATIVE MEASURES

Eye Protection:

Wear safety glasses or chemical goggles to prevent eye contact with dust. Have eye washing facilities readily available where eye contact can occur. Do not wear contact lenses when working with this substance.

Skin Protection:

Wear impervious gloves and protective clothing to prevent skin contact. Use good personal hygiene. Wear regularly cleaned work clothing. Showering and changing into street clothing after work is desirable.

Respiratory Protection:

Ventilation may be used to reduce airborne concentrations. If ventilation cannot reduce airborne concentrations below acceptable limits, appropriate respiratory protection should be used. Use NIOSH or MSHA approved respiratory protective equipment when airborne exposure limits are exceeded. NIOSH/MSHA approved respiratory protective equipment must be available for non-routine and emergency use.

ENVIRONMENTAL PROTECTION DATA

Spill Or Release To The Environment:

Take immediate steps to stop and contain the spill. Caution should be exercised regarding personnel safety and exposure to the spilled material.

Emergency Action:

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. (Also see Personal Protection Information section.) Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.

Spill or Leak Procedure:

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills:

Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CYCLOHEXANE****0121****PRODUCT INFORMATION**

Product Name: Cyclohexane

Chinese Name: 環己烷

Common Synonyms: Hexahydrobenzene; Hexamethylene; Hexanaphthene

Chemical Family: Aliphatic Hydrocarbons

Formula: C_6H_{12}

Formula Wt.: 84.16

CAS No.: 110-82-7

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: 81 deg. C (177 deg. F) (@ 760 mmHg)
Melting Point: 7 deg. C (44 deg. F) (@ 760 mmHg)
Specific Gravity: 0.78 (H₂O=1)
Solubility(H₂O): Negligible (<0.1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Clear, colorless liquid. Faint odor.

Vapor Pressure (mmHg): 95 (20 deg. C)
Vapor Density (Air=1): 2.9
Evaporation Rate: >1 (Butyl Acetate = 1)
% Volatiles By Volume: 100 (21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): -19 deg. C (-4 deg. F)
Autoignition Temperature: 244 deg. C (473 deg. F)
Flammable Limits: Upper - 8.4 % Lower - 1.3 %
Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Vapors may flow along surfaces to distant ignition sources and flash back. closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition
Incompatibles: Strong oxidizing agents
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation:

Headache, nausea, vomiting, dizziness, narcosis, respiratory failure, low blood pressure, central nervous system depression, severe irritation of respiratory system

Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion:

Headache, nausea, vomiting, dizziness, gastrointestinal irritation, central nervous system depression, hearing loss, and may be fatal

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 1050 mg/m³ (300 ppm)

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 1050 mg/m³ (300 ppm)

Toxicity Of Components:

Oral Rat LD₅₀ For Cyclohexane

29.8 g/kg

Intraperitoneal Mouse LD₅₀ For Cyclohexane

1297 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, respiratory system, skin, central nervous system

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. if swallowed, do not induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 1000 ppm, a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection: Safety goggles, uniform, apron, neoprene gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CYCLOHEXENE****0122****PRODUCT INFORMATION**

Product Name: Cyclohexene

Chinese Name: 環己烯

Common Synonyms: Benzene Tetrahydride; 1,2,3,4-Tetrahydrobenzene

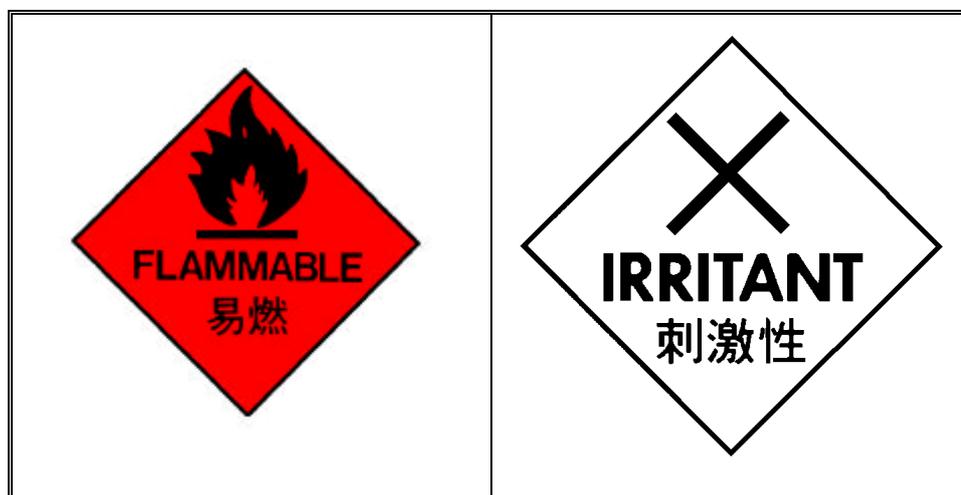
Chemical Family: Aliphatic Hydrocarbons

Formula: $\text{CH}:\text{CH}(\text{CH}_2)_3\text{CH}_2$

Formula Wt.: 82.15

CAS No.: 110-83-8

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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HEALTH HAZARD DATA

Inhalation: Nausea, vomiting, headache, unconsciousness, may cause narcosis

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 1015 mg/m³ (300 ppm)

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 1015 mg/m³ (300 ppm)

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Skin, Eyes, Respiratory System

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 1000 ppm, a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**DIETHYLAMINE****0123****PRODUCT INFORMATION**

Product Name: Diethylamine
Chinese Name: 二乙<基>胺
Common Synonyms: N/A
Chemical Family: Amines
Formula: $(C_2H_5)_2NH$
Formula Wt.: 73.14
CAS No.: 109-89-7
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid

Boiling Point: 56 deg. C (132 deg. F)
(@ 760 mmHg)

Melting Point: -50 deg. C (-58 deg. F)
(@ 760 mmHg)

Specific Gravity: 0.71
(H₂O=1)

Solubility(H₂O): Complete (100%)

Vapor Pressure (mmHg): 194

(20 deg. C)

Vapor Density (Air=1): 2.5

Evaporation Rate: 16.9

(Butyl Acetate = 1)

% Volatiles By Volume: 100

(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: Colorless liquid. Ammonia odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): -28 deg. C (-20 deg. F)

Autoignition Temperature: 311 deg. C (594 deg. F)

Flammable Limits: Upper - 10.1 % Lower - 1.8 %

Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:

Vapors may flow along surfaces to distant ignition sources and flash back. closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

Toxic Gases Produced: Oxides of nitrogen, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Heat, flame, other sources of ignition

Incompatibles: Strong acids, strong oxidizing agents, most common metals

Decomposition Products: Oxides of nitrogen, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Severe irritation of respiratory system, may cause pulmonary edema
 Skin Contact: Severe irritation or burns
 Eye Contact: Severe irritation or burns, prolonged contact may cause skin sensitization
 Skin Absorption: Rapid absorption
 Ingestion: Nausea, vomiting, gastrointestinal irritation, burns to mouth and throat

Chronic Effects: None Identified

Threshold Limit Value (TLV/TWA): 30 mg/m³ (10 ppm)

Short-Term Exposure Limit (STEL): 75 mg/m³ (25 ppm)

Permissible Exposure Limit (PEL): 30 mg/m³ (10 ppm)

Toxicity Of Components:

Oral Rat LD₅₀ For Diethylamine 540 mg/kg

Inhalation-4hr Rat LC₅₀ For Diethylamine 4000 ppm

Skin Rabbit LD₅₀ For Diethylamine 820 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory System, Skin, Eyes

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, absorption, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 1500 ppm, a chemical cartridge respirator with ammonia/amine cartridge is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, neoprene gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS 2,4-DINITROPHENYLHYDRAZINE 0124**PRODUCT INFORMATION**

Product Name: 2,4-Dinitrophenylhydrazine

Chinese Name: 2,4-二硝基苯

Common Synonyms: N/A

Chemical Family: Hydrazines

Formula: $(\text{NO}_2)_2\text{C}_6\text{H}_3\text{NHNH}_2$

Formula Wt.: 198.14

CAS No.: 119-26-6

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 194 deg. C (381 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: N/A Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Slight (0.1-1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Red crystalline powder.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 209 deg. C (410 deg. F)
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool. Flush area with water until cool so reignition will not occur.

Unusual Fire & Explosion Hazards:
Can react violently with shock, friction or heat. Dry material is an explosive.

Toxic Gases Produced: Oxides of nitrogen, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Unstable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition, shock, dryness
Incompatibles: Strong oxidizing agents
Decomposition Products: Oxides of nitrogen, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Prolonged contact may cause skin sensitization
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: May be harmful
Chronic Effects: Blood Damage
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Oral Rat LD₅₀ For 2,4-Dinitrophenylhydrazine 654 mg/kg
Intraperitoneal Mouse LD₅₀ For Water 190 g/kg
Intravenous Mouse LD₅₀ For Water 25 g/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Eyes, blood
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Skin contact, eye contact, ingestion

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact: In case of contact, flush skin with water.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in cool, dry, well-ventilated area away from heat, sparks, or flame.

Special Precautions:

This product contains at least 10% water - if the water content decreases below this level, it becomes an explosive. Avoid conditions that could lead to loss of water. Dinitrophenylhydrazine may be shipped dry as drugs, n.o.s. or medicine, n.o.s. without any other requirements by rail or highway if the amount in one outside package does not exceed 4 ounces, and material is packaged in securely closed bottles that are cushioned to prevent breakage. This baker material is wetted and should not be allowed to dry. Dinitrophenylhydrazine is explosive when dry.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Shut off ignition sources; no flares, smoking, or flames in area. Moisten material with water and place it into loosely-covered plastic or fiberboard containers for later disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ETHYL BENZOATE****0125****PRODUCT INFORMATION**

Product Name: Ethyl Benzoate

Chinese Name: 苯<甲>酸乙酯

Common Synonyms: Benzoic Ether; Benzoic Acid, Ethyl Ester

Chemical Family: Esters

Formula: $C_6H_5COOC_2H_5$

Formula Wt.: 150.18

CAS No.: 93-89-0

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Liquid
Boiling Point: 213 deg. C (415 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: -34 deg. C (-29 deg. F) Vapor Density (Air=1): 5.17
(@ 760 mmHg)
Specific Gravity: 1.05 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless liquid. Aromatic odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 87 deg. C (190 deg. F)
Autoignition Temperature: 510 deg. C (952 deg. F)
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition
Incompatibles: Strong oxidizing agents
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of nose and throat
Skin Contact: Irritation

Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Oral Rat LD₅₀ For Ethyl Benzoate 2100 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None Indicated

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:
In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:
None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**ETHYLAMINE, 70%****0126****PRODUCT INFORMATION**

Chemical Name: Ethylamine, 70%

Chinese Name: 乙<基>胺

Synonyms: Monoethylamine 70%; ETN-70%; Aminoethane.

Chemical Family: Alkylamines

Formula: $C_2H_5NH_2$

Molecular Weight: 45.09

CAS Number: 75-04-7

Use:

Used as a solvent in petroleum and vegetable oil refining, as raw material for ethylated amides in plasticizers, and used in polyester fiber manufacturing.

RISK SYMBOL

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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PHYSICAL DATA

Boiling Point @ 760 mm Hg : 39.1 - 42.0 deg. C
Freezing Point : -83 deg. C
Specific Gravity (H₂O = 1) : 0.797 @ 20/20 deg. C
Vapour Pressure At 20 deg. C : 360 mm Hg
Vapour Density (Air = 1) : 1.55 (Ethylamine)
Solubility In Water, % By Weight : 100 @ 20 deg. C
% Volatiles By Volume : 100
Evaporation Rate (Butyl Acetate = 1) : ~20
Appearance And Odour : Water-white liquid; characteristic odour.

FIRE AND EXPLOSION DATA

Flash Point : -25 deg. C, SETA closed cup
Flammable Limits In Air, % By Volume : Upper: 14% Lower: 3.5%
Extinguishing Media :
Use alcohol-type or all-purpose-type foam by manufacturers' recommended techniques for large fires.
Use carbon dioxide or dry chemical media for small fires.

Special Fire Fighting Procedures

Use remote spray monitors or fight fires from behind shields. Use water spray to cool fire-exposed containers and structures, and to disperse vapours; reignition is possible. Use self-contained breathing apparatus and protective clothing.

Unusual Fire And Explosion Hazards

Vapours formed from the product may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges, or other ignition sources at locations distant from product handling point. Vapours may settle in low or confined areas, or travel a long distance to an ignition source and flash back explosively. This material may produce a floating fire hazard in extreme fire conditions. During a fire, oxides of nitrogen may be produced.

REACTIVITY DATA

Stability: Stable

Conditions To Avoid: None currently known

Incompatibility :

Mineral acids, strong oxidizing agents, and chlorine or hypochlorites. Avoid reaction with chlorine or alkaline hypochlorite; not only is the reaction highly exothermic, but the products (chloramines) may be explosive.

Hazardous Combustion Or Decomposition Products:

Burning may produce carbon monoxide and/or carbon dioxide, and oxides of nitrogen. Carbon monoxide is highly toxic if inhaled; carbon dioxide in sufficient concentrations can act as an asphyxiant. Acute overexposure to oxides of nitrogen may result in irritation of the respiratory tract.

Hazardous Polymerization: Will not occur

HEALTH HAZARD DATA

Exposure limits: 10 ppm	TWA	ACGIH (1991-92)
LC ₅₀ : 2300 mg/M ³	Inh. Mammal	RTECS (1992)
LD ₅₀ : 400 mg/kg	Oral-Rat	RTECS (1992)
390 mg/kg	Skin-Rabbit	RTECS (1992)
540 mg/kg	Oral-Rat	Union Carbide

Swallowing :

Moderately toxic. May cause burns of the mouth, throat, oesophagus, and stomach with severe abdominal and chest pain, nausea, vomiting, diarrhea, dizziness, faintness, drowsiness, thirst, collapse, and coma. Aspiration into the lungs may occur during ingestion or vomiting, resulting in lung injury.

Skin Absorption :

Toxic. Prolonged or widespread contact may result in the absorption of potentially harmful amounts of material.

Inhalation :

Vapours are irritating and cause coughing, discomfort and discharge in the nose, discomfort in the throat and chest, tracheitis, bronchitis, pneumonitis, and pulmonary oedema.

Skin Contact :

Vapours may cause irritation, seen as local redness and possible swelling. Liquid causes local discomfort or pain, severe excess redness and swelling with chemical burns.

Eye Contact :

Causes pain and severe excess reddening and swelling of the conjunctiva, with chemical burns of the cornea. Corneal injury may be severe, extensive, and if not treated promptly, could result in permanent impairment of vision. Vapour may cause temporary disturbance of vision

Effects Of Repeated Overexposure : None currently known

Medical Conditions Aggravated By Overexposure :

Breathing of vapour and/or mist may aggravate asthma and inflammatory or fibrotic pulmonary disease. Because of its irritating properties, this material may aggravate an existing dermatitis.

FIRST AID MEASURES

Swallowing :

If patient is fully conscious, give 2 glasses of water or milk at once. Do not induce vomiting. Call a physician without delay.

Skin :

Immediately flush skin with plenty of water while removing contaminated clothing and shoes. Call a physician without delay. Wash clothing before wearing again. Discard shoes.

Inhalation :

Remove to fresh air. Give artificial respiration if not breathing. Oxygen may be given by qualified personnel if breathing is difficult. Call a physician.

Eyes :

Immediately flush eyes thoroughly with water for at least 15 minutes. Seek medical attention urgently, preferably from an ophthalmologist.

Notes To Physician :

There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient. Due to the severely irritant nature of the material, any aspiration during vomiting could result in severe lung injury. Therefore, emesis should not be induced mechanically or pharmacologically. However, the acute peroral systemic toxicity of the material indicates that evacuation of the stomach contents should be undertaken at the earliest possible time by means carrying the least likelihood for aspiration (e.g., the use of gastric lavage with endotracheal intubation). Delayed onset pulmonary oedema may occur after exposure to moderately high vapour concentrations. Patient should be kept under observation for at least 72 hours after exposure by inhalation. Exposure to the vapour may cause minor transient oedema of the corneal epithelium. This condition, referred to as glaucopsia, "blue haze", or "blue-gray haze" produces a blurring of vision against a general bluish haze and the appearance of halos around bright objects. The effect disappears spontaneously within a few hours of the end of an exposure, and leaves no sequelae. Although not detrimental to the eye per se, glaucopsia predisposes an affected individual to physical accidents and reduces the ability to undertake skilled tasks such as driving a motorized vehicle.

PREVENTATIVE MEASURES

Respiratory Protection :

NIOSH or MSHA approved self-contained breathing apparatus in high vapour concentrations.

Ventilation :

This product should be confined within vapour-tight equipment, in which case general (mechanical) room ventilation is satisfactory. Special local ventilation is needed at points where vapours can be expected to escape to the workplace air.

Protective Gloves : Butyl

Eye Protection : Monogoggle

Other Protective Equipment : Eye bath, safety shower, and chemical apron.

Storage:

Drums should be stored in a shaded area; white drums are used to minimize heat absorption. If a drum is warm, it should be cooled before opening to reduce internal pressure and minimize venting of vapours when the bung is unscrewed. Good ventilation should be provided in the area where drums will be opened and protective equipment should be worn.

Process Hazard:

Sudden release of hot organic chemical vapours or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions. Any use of this product in elevated-temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions. Further information is available in a technical bulletin entitled "Ignition Hazards of Organic Chemical Vapours."

ENVIRONMENTAL PROTECTION DATA

Spill :

Extinguish and do not turn on any ignition source until the area is determined to be free from explosion or fire hazards. Wear suitable protective equipment. Avoid contact with liquid and vapours. Small spills could be flushed with large quantities of water. Larger spills should be collected for disposal. Toxic to fish; avoid discharge to natural waters.

Material Safety Data Sheet

City University of Hong Kong

**MSDS ETHYLENEDIAMINETETRAACETIC ACID 0127
DISODIUM SALT**

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PRODUCT INFORMATION

Chemical Name: Ethylenediaminetetraacetic Acid, Disodium Salt

Chinese Name: 乙二胺四醋酸鈉

Synonyms: Sodium EDTA

Chemical Family: Edetates

Chemical Formula: $C_{10}H_{14}N_2O_8Na_2 \cdot 2H_2O$

CAS No. : 600-00-4

Product Use: Detergents, liquid soaps, shampoos; analytical chemistry; spectrophotometric titrations

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RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid
Odour and Appearance: White, odourless crystals
Odour Threshold (ppm): Not applicable
Vapour Pressure (mmHg): Not applicable
Vapour Density (Air=1): Not applicable
Evaporation Rate: Not applicable
Boiling Point : Not applicable
Freezing Point : Greater than 300 deg. C (melting point)
pH: 11.8
Specific Gravity: 0.8
Coefficient of Water/Oil distribution: Not applicable

FIRE AND EXPLOSION DATA

Flammability: Non Flammable
Point (Method Used): Non combustible
Autoignition Temperature: Not available
Upper Flammable Limit (% by volume): Not available
Lower Flammable Limit (% by volume): Not available
Extinguishing Media: Water spray, carbon dioxide, dry chemical powder
Flash Hazardous Combustion Products: None
Sensitivity to Impact: Not available
Sensitivity to Static discharge: Not available

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances:
Aluminum reacts with water solutions of product to release hydrogen. Strong oxidizing agents and strong acids

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide and nitrogen oxides

HEALTH HAZARD DATA

Inhaled: May cause coughing, wheezing, respirator distress and mucous membrane irritation.

In contact with skin: Slightly irritating to skin

In contact with eyes: Moderately irritating to eyes

Ingested:

May cause burns to the gastrointestinal tract. In large quantities, product may cause hypocalcemic tetany.

Toxicological Data:

LD₅₀: (oral, rat) 2000 mg/kg

LC₅₀: Not available

Carcinogenicity: Not available

Teratogenicity: Not available

Reproductive Effects: Not available

Mutagenicity: Not available

Synergistic Products: Not available

FIRST AID MEASURES

Eyes:

Flush immediately with large amounts of water for fifteen (15) minutes. Call a physician immediately.

Skin:

Wash with plenty of soap and water. Wash clothing before reuse. Seek medical attention if skin shows signs of irritation.

Inhalation:

Remove to fresh air. If breathing has stopped, perform artificial respiration. Keep victim warm and at rest.

Ingestion:

Give victim large amounts of water or milk to drink for dilution effect. Do not induce vomiting.

PREVENTATIVE MEASURES

Engineering Controls: Fume hoods or local exhaust recommended.

Respiratory Protection: Use a NIOSH approved respirator

Eye Protection: Safety glasses or face shield

Skin Protection: Impervious gloves and clothing.

Other Personal Protective Equipment: Safety shower and eyewash fountain in work area.

Handling Procedures and Equipment:

Handle as a 1% caustic powder. Do not store in contact with aluminum or copper.

Storage Requirements: Do not store in contact with aluminum of copper.

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ENVIRONMENTAL PROTECTION DATA

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Leak and Spill Procedure:

Prevent product from entering drinking water supplies or streams. Collect product into containers for disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**1,6-HEXANEDIAMINE****0128****PRODUCT INFORMATION**

Product Name: 1,6-Hexanediamine
Chinese Name: 己乙胺
Common Synonyms: Hexamethylenediamine
Chemical Family: Amines
Formula: $\text{NH}_2(\text{CH}_2)_6\text{NH}_2$
Formula Wt.: 116.21
CAS No.: 124-09-4
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: 205 deg. C (401 deg. F) Vapor Pressure (mmHg): 1.1
(@ 760 mmHg) (20 deg. C)
Melting Point: 39 deg. C (102 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 0.84 Evaporation Rate: >1
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White to yellow crystals. amine-like odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 93 deg. C (200 deg. F)
Autoignition Temperature: N/A
Flammable Limits: Upper - 6.3 % Lower - 0.7 %
Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Ammonia, oxides of nitrogen, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition
Incompatibles: Strong oxidizing agents, strong acids, organic materials
Decomposition Products: Ammonia, oxides of nitrogen, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Severe irritation or burns of mucous membranes, irritation of upper respiratory tract
Skin Contact: Severe irritation or burns

Eye Contact: Severe irritation or burns
Skin Absorption: May be harmful
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Oral Rat LD₅₀ For 1,6-Hexanediamine 750 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Reproductive Effects: None identified.
Carcinogenicity: None identified.
Target Organs: Eyes, skin
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Eye contact, skin contact, inhalation, absorption

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation:

Call a physician. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area or cabinet.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

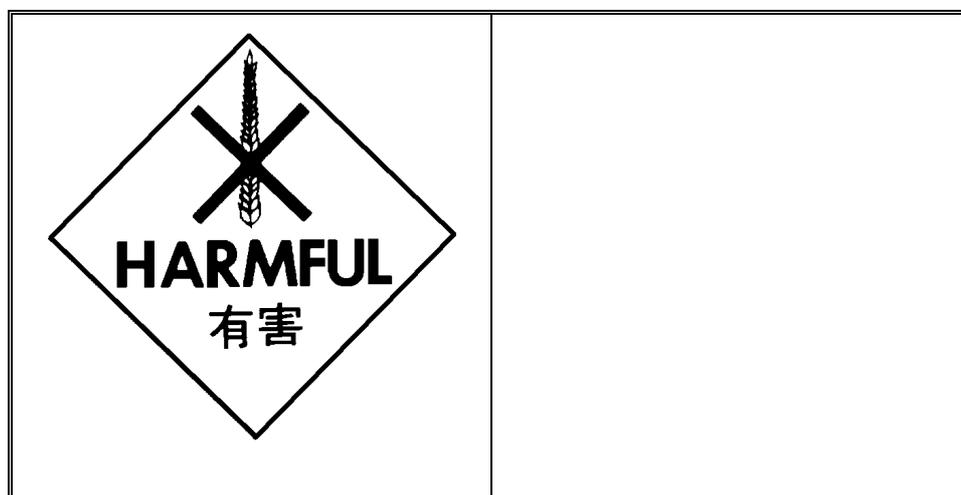
Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking, or flames in area. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**IODINE****0129****PRODUCT INFORMATION**

Product Name: Iodine
Chinese Name: 碘
Common Synonyms: N/A
Chemical Family: Halogens
Formula: I_2
Formula Wt.: 253.81
CAS No.: 7553-56-2
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: 184 deg. C (363 deg. F) Vapor Pressure (mmHg): 0.31
(@ 760 mmHg) (20 deg. C)
Melting Point: 114 C (237 F) Vapor Density (Air=1): 9.0
(@ 760 mmHg)
Specific Gravity: 4.93 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: 5.4 (Saturated Solution)
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Purple to black crystals. characteristic odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: Moderate oxidizer. Contact with other material may cause fire.
Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition, sunlight
Incompatibles:
Strong reducing agents, ammonia, ammonium salts, acetylene, acetaldehyde, combustible materials, aluminum, chemically active metals, powdered metals, carbides, ammonium hydroxide
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation:

Irritation of mucous membranes, severe irritation or burns of respiratory system, pulmonary edema, lung inflammation, and may be fatal

Skin Contact: Severe irritation or burns

Eye Contact:

Severe irritation or burns, prolonged contact may cause permanent corneal damage, and blindness, may occur

Skin Absorption: None identified

Ingestion:

Irritation and burns of mouth and throat, gastrointestinal pain, nausea, vomiting, fever, shock, bloody urine, difficult breathing, and may be fatal

Chronic Effects: Lung damage, thyroid damage, bladder damage

Threshold Limit Value (TLV/TWA): 1.0 mg/m³ (0.1 ppm)

TLV listed denotes ceiling limit.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 1 mg/m³ (0.1 ppm)

PEL listed denotes ceiling limit.

Toxicity Of Components:

Oral Rat LD₅₀ For Iodine

14 g/kg

Oral Mouse LD₅₀ For Iodine

22 g/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, eyes, skin, central nervous system, cardiovascular system

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in corrosion-proof area. Keep containers out of sun and away from heat.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**MERCUROUS CHLORIDE****0130****PRODUCT INFORMATION**

Product Name: Mercurous Chloride

Chinese Name: 氯化汞(I)

Common Synonyms: Mercury (I) Chloride; Calomel; Mercury Monochloride

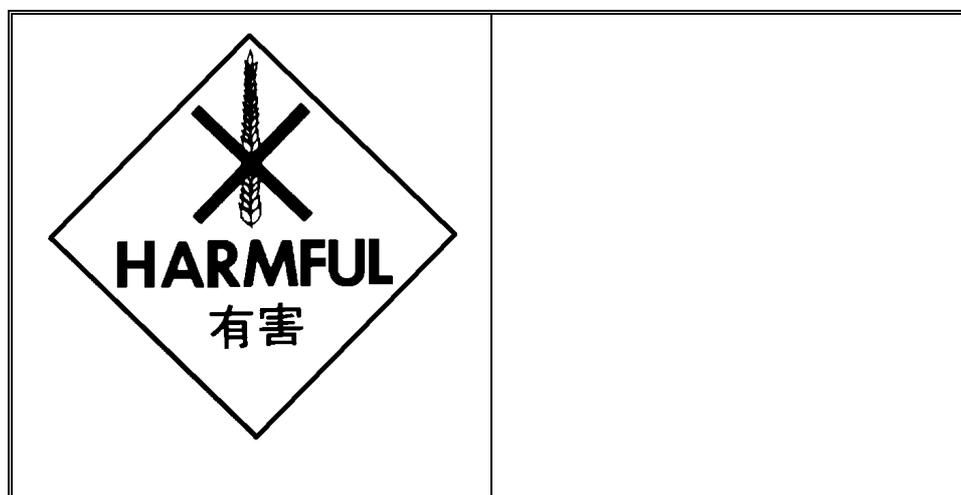
Chemical Family: Mercury Compounds

Formula: Hg_2Cl_2

Formula Wt.: 472.09

CAS No.: 10112-91-1

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: 384 deg. C (723 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 302 deg. C (575 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 7.15 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Hydrogen chloride, mercury fumes

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Light, sunlight
Incompatibles:
Strong bases, carbonates, sulfides, cyanides, ammonia, sulfites, sulfates, alkalies, strong oxidizing agents, metallic salts
Decomposition Products: Hydrogen chloride, mercury fumes

HEALTH HAZARD DATA

Inhalation: Tightness and pain in chest, coughing, difficult breathing, is harmful and may be fatal

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Central nervous system depression, is harmful and may be fatal

Chronic Effects:

Mercury build-up in the brain, liver, and kidneys, headache, shakes, loose teeth, loss of appetite, skin ulceration, impaired memory

Threshold Limit Value (TLV/TWA): 0.1 mg/m³

The TLV Listed Denotes TLV (Skin).

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Mercurous Chloride

210 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Eye contact, skin contact, inhalation, ingestion

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep product out of light. Keep container tightly closed. Store in secure poison area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS FORMALIN, 10% V/V SOLUTION, 0131**PRODUCT INFORMATION**

Product Name: Formalin, 10% v/v Solution, Neutralized

Chinese Name: 福爾馬林, 甲醛水溶液

Common Synonyms: N/A

Chemical Family: Volumetric Solutions And Concentrates

Formula: N/A

Formula Wt.: N/A

CAS No.: 50-00-0

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: N/A Vapor Density (Air=1): N/A
Specific Gravity: 1.09 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Complete (100%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Clear, colorless liquid. Pungent odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 84 deg. C (185 deg. F)
Autoignition Temperature: N/A
Flammable Limits: Upper - 73.0 % Lower - 7.0 %
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Formaldehyde, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame
Incompatibles:
Strong oxidizing agents, strong acids, strong bases, alkalis, alkali metals, amines and ammonia, phenol, strong reducing agents
Decomposition Products: Formaldehyde, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation:

Is harmful and may be fatal, headache, nausea, vomiting, dizziness, drowsiness, irritation of upper respiratory tract, unconsciousness

Skin Contact: Severe irritation or burns, prolonged contact may cause skin sensitization

Eye Contact: Severe irritation or burns

Skin Absorption: Rapid absorption

Ingestion:

Is harmful and may be fatal, nausea, vomiting, gastrointestinal irritation, burns to mouth and throat

Chronic Effects: Kidney damage, liver damage

Threshold Limit Value (TLV/TWA): 1.5 mg/m³ (0.75 ppm)

TLV is for formaldehyde.

Short-Term Exposure Limit (STEL): 3 mg/m³ (2 ppm)

STEL is for formaldehyde.

Permissible Exposure Limit (PEL): 1.5 mg/m³ (0.75 ppm)

PEL is for formaldehyde.

Toxicity Of Components:

Oral Rat LD₅₀ For Formaldehyde 800 mg/kg

Skin Rabbit LD₅₀ For Formaldehyde 270 mg/kg

Subcutaneous Rat LD₅₀ For Formaldehyde 420 mg/kg

Inhalation Rat LC₅₀ For Formaldehyde 590 mg/kg

Oral Rat LD₅₀ For Sodium Phosphate, Monobasic 8290 mg/kg

Intraperitoneal Mouse LD₅₀ For Water 190 g/kg

Intravenous Mouse LD₅₀ For Water 25 g/kg

Carcinogenicity: NTP: YES IARC: No Z LIST: No OSHA REG: No

Carcinogenicity:

This substance is listed as an acgih suspected human carcinogen and a NTP anticipated human carcinogen.

Reproductive Effects: Tests on laboratory animals indicate that formaldehyde may be mutagenic.

Target Organs: Respiratory system, eyes, skin, liver, kidneys

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, inhalation, eye contact, skin contact, absorption

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 50 ppm, a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in secure poison area. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Use water spray to reduce vapors. take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**TERT-BUTYL ALCOHOL****0132****PRODUCT INFORMATION**

Product Name: Tert-Butyl Alcohol
Chinese Name: 叔丁醇, 三級丁醇
Common Synonyms: 2-Methyl-2-Propanol
Chemical Family: Alcohols
Formula: $(\text{CH}_3)_3\text{COH}$
Formula Wt.: 74.12
CAS No.: 75-65-0
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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HEALTH HAZARD DATA

Inhalation:

Irritation of nose and throat, headache, nausea, dizziness, fatigue, severe irritation of respiratory system, narcosis, weakness in arms and legs

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 300 mg/m³ (100 ppm)

Short-Term Exposure Limit (STEL): 450 mg/m³ (150 ppm)

Permissible Exposure Limit (PEL): 300 mg/m³ (100 ppm)

Toxicity Of Components:

Oral Rat LD₅₀ For Tert-Butyl Alcohol

3500 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 5000 ppm, a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions:

Bond and ground containers when transferring liquid. Product may solidify at room temperature.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**2-METHYLBUTANE****0133****PRODUCT INFORMATION**

Product Name: 2-Methylbutane
Chinese Name: 2-甲基丁烷
Common Synonyms: Iso-Pentane; Ethyldimethylmethane
Chemical Family: Aliphatic Hydrocarbons
Formula: $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)_2$
Formula Wt.: 72.15
CAS No.: 78-78-4
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

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Physical State: Liquid
Boiling Point: 28 deg. C (82 deg. F) Vapor Pressure (mmHg): 595
(@ 760 mmHg) (20 deg. C)
Melting Point: -160 deg. C (-256 deg. F) Vapor Density (Air=1): 2.48
(@ 760 mmHg)
Specific Gravity: 0.63 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless to yellow liquid. Faint gasoline-like odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): -51 deg. C (-60 deg. F)
Autoignition Temperature: 419 deg. C (788 deg. F)
Flammable Limits: Upper - 8.3 % Lower - 1.4 %
Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards:
Vapors may flow along surfaces to distant ignition sources and flash back. closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition
Incompatibles: Strong oxidizing agents
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation:

Headache, nausea, vomiting, dizziness, narcosis, respiratory failure, low blood pressure, central nervous system depression

Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Irritation of mucous membranes, may cause gas embolism

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

No Information Is Available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Lungs, central nervous system

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, do not induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a chemical cartridge respirator with organic vapor cartridge is recommended. If concentration exceeds capacity of cartridge respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHYL SALICYLATE****0134****PRODUCT INFORMATION**

Product Name: Methyl Salicylate

Chinese Name: 水楊酸甲酯

Common Synonyms: Synthetic Wintergreen Oil; Betula Oil; 2-Hydroxybenzoic Acid, Methyl Ester

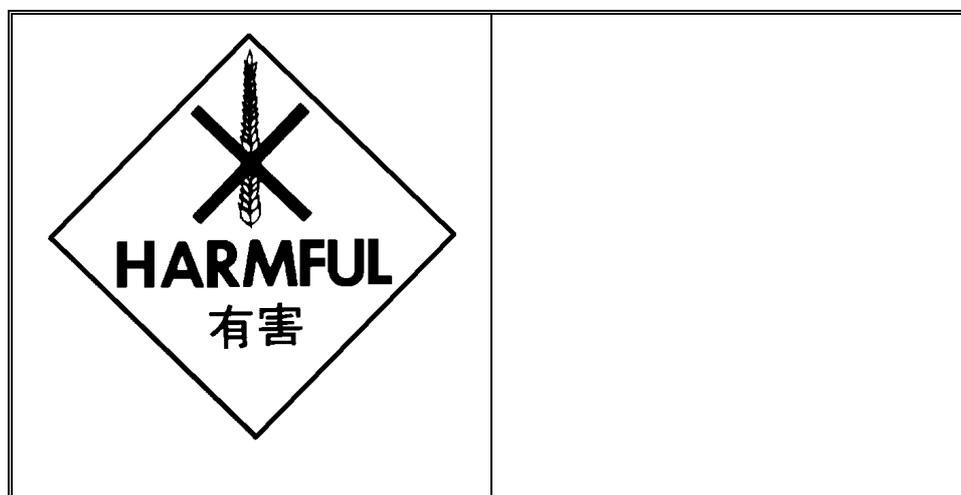
Chemical Family: Esters

Formula: $2\text{-HOC}_6\text{H}_4\text{COOCH}_3$

Formula Wt.: 152.15

CAS No.: 119-36-8

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

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Physical State: Liquid
Boiling Point: 222 deg. C (431 deg. F) Vapor Pressure (mmHg): 0.1
(@ 760 mmHg) (20 deg. C)
Melting Point: -9 deg. C (15 deg. F) Vapor Density (Air=1): 5.24
(@ 760 mmHg)
Specific Gravity: 1.18 Evaporation Rate: 1
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Clear, colorless liquid. wintergreen odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 101 deg. C (214 deg. F)
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray, carbon dioxide, dry chemical or ordinary foam.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Sunlight
Incompatibles: Strong oxidizing agents, strong bases
Decomposition Products: Alcohols, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Prolonged contact may cause irritation
Eye Contact: Irritation

Skin Absorption: None identified
Ingestion: Headache, nausea, vomiting, dizziness, gastrointestinal irritation
Chronic Effects: Damage to liver, kidneys, blood
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Oral Rat LD₅₀ For Methyl Salicylate
Oral Rabbit LD₅₀ For Methyl Salicylate
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

887 mg/kg
1300 mg/kg

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Heart, liver, kidneys, blood
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: If swallowed, if conscious, immediately induce vomiting.
Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:
In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:
None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**NITROBENZENE****0135****PRODUCT INFORMATION**

Product Name: Nitrobenzene

Chinese Name: 硝基苯

Common Synonyms: Nitrobenzol; Mirbane Oil; Essence Of Mirbane

Chemical Family: Aromatic Hydrocarbons

Formula: $C_6H_5NO_2$

Formula Wt.: 123.11

CAS No.: 98-95-3

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

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HEALTH HAZARD DATA

Inhalation:

Cyanosis, unconsciousness, headache, nausea, vomiting, dizziness, rapid ineffective breathing, low blood pressure, irritation of mucous membranes, weakness, convulsions, and may be fatal

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: Rapid absorption, may cause increased heart rate, convulsions, may be fatal

Ingestion:

Cyanosis, unconsciousness, headache, nausea, vomiting, dizziness, weakness, rapid ineffective breathing, low blood pressure, convulsions, and may be fatal

Chronic Effects:

Central nervous system damage, blurred vision, liver damage, kidney damage, anemia, irritation of upper respiratory tract

Threshold Limit Value (TLV/TWA): 5 mg/m³ (1 ppm)

The TLV Listed Denotes TLV (Skin).

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 5 mg/m³ (1 ppm)

The PEL Listed Denotes PEL (Skin).

Toxicity Of Components:

Oral Rat LD₅₀ For Nitrobenzene 640 mg/kg

Skin Rat LD₅₀ For Nitrobenzene 2100 mg/kg

Intraperitoneal Rat LD₅₀ For Nitrobenzene 640 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Blood, liver, kidneys, cardiovascular system, skin

Medical Conditions Generally Aggravated By Exposure:

Respiratory system disease, heart disorders, blood disorders, liver disorders

Primary Routes Of Entry: Inhalation, absorption, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Thorough cleansing of the entire contaminated area of the body including scalp and nails is of the utmost importance.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 50 ppm, a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, viton gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area or cabinet.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**STEARIC ACID****0136****PRODUCT INFORMATION**

Product Name: Stearic Acid

Chinese Name: 硬脂酸

Common Synonyms: Octadecanoic Acid; 1-Heptadecanecarboxylic Acid

Chemical Family: Organic Acids

Formula: $C_{18}H_{36}O_2$

Formula Wt.: 284.49

CAS No.: 57-11-4

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Intravenous Mouse LD₅₀ For Stearic Acid

23 mg/kg

Intravenous Rat LD₅₀ For Stearic Acid

21.5 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Store in a cool, well-ventilated area away from sources of heat, flame, or ignition.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PHENYLHYDRAZINE****0138****PRODUCT INFORMATION**

Product Name: Phenylhydrazine
Chinese Name: 苯肼
Common Synonyms: Hydrazinobenzene
Chemical Family: Hydrazines
Formula: $C_6H_5NHNH_2$
Formula Wt.: 108.14
CAS No.: 100-63-0
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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HEALTH HAZARD DATA

Inhalation: Irritation of mucous membranes

Skin Contact: Severe irritation or burns, prolonged contact may cause skin sensitization

Eye Contact: Severe irritation or burns

Skin Absorption: None identified

Ingestion: Nausea, vomiting

Chronic Effects: Kidney damage, liver damage

Threshold Limit Value (TLV/TWA): 20 mg/m³ (5 ppm)

The TLV Listed Denotes TLV (Skin).

Short-Term Exposure Limit (STEL): 45 mg/m³ (10 ppm)

Permissible Exposure Limit (PEL): 22 mg/m³ (5 ppm)

The PEL Listed Denotes PEL (Skin).

Toxicity Of Components:

Oral Rabbit LD ₅₀ For Phenylhydrazine	80 mg/kg
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Oral Rat LD ₅₀ For Phenylhydrazine	188 mg/kg
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Oral Guinea Pig LD ₅₀ For Phenylhydrazine	80 mg/kg
--	----------

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: This substance is listed as an acgih suspected human carcinogen.

Reproductive Effects: None identified.

Target Organs: Blood, respiratory system, skin, liver, kidneys

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations above 5 ppm, a self-contained breathing apparatus is advised.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in cool, dry, well-ventilated area away from heat, sparks, or flame. Store in light-resistant containers.

Special Precautions: Product may solidify at room temperature.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS PHOSPHORUS PENTACHLORIDE 0139**PRODUCT INFORMATION**

Product Name: Phosphorus Pentachloride

Chinese Name: 五氯化磷

Common Synonyms: Phosphorous (V) Chloride; Pentachlorophosphorane; Phosphorous Perchloride

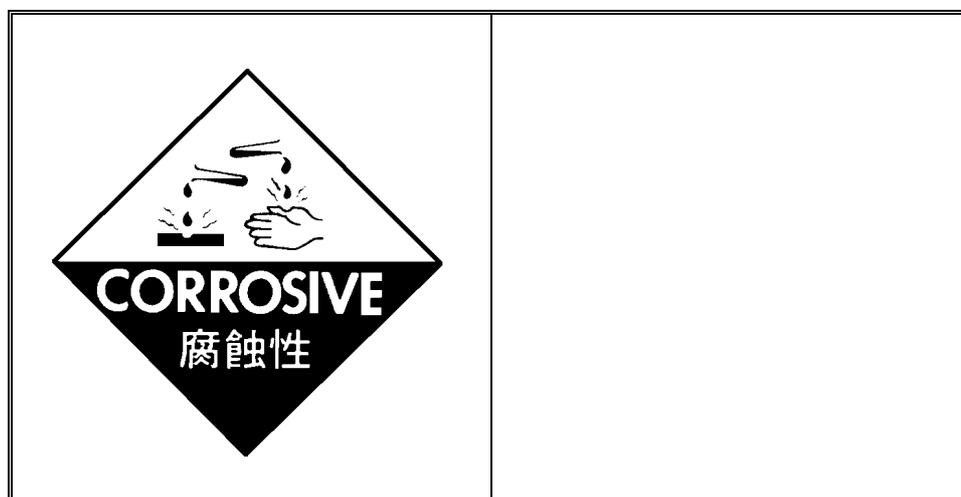
Chemical Family: Phosphorus And Phosphorus Compounds

Formula: PCl_5

Formula Wt.: 208.24

CAS No.: 10026-13-8

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 162 deg. C (323 deg. F) Sublimes Vapor Density (Air=1): 7.2
(@ 760 mmHg)
Specific Gravity: 3.60 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Decomposes % Volatiles By Volume: N/A
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Light yellow solid. Hydrochloric acid odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use dry chemical or carbon dioxide. Do not use water.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards:
A violent exothermic reaction occurs with water. Sufficient heat may be produced to ignite combustible materials. note: sublimes at melting point.

Toxic Gases Produced: Hydrogen chloride, oxides of phosphorus

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture, heat
Incompatibles:
Water, chemically active metals, sodium, potassium, aluminum, alkalis, fluorine, magnesium oxide, hydroxylamine, chlorine dioxide, phosphorus oxides

Decomposition Products: Hydrogen chloride, oxides of phosphorus

HEALTH HAZARD DATA

Inhalation: None identified
 Skin Contact: None identified
 Eye Contact: None identified
 Skin Absorption: None identified
 Ingestion: None identified
 Chronic Effects: None identified
 Threshold Limit Value (TLV/TWA): 1.0 mg/m³ (0.1 ppm)
 Short-Term Exposure Limit (STEL): Not established
 Permissible Exposure Limit (PEL): 1 mg/m³
 Toxicity Of Components:
 Oral Rat LD₅₀ For Phosphorus Pentachloride 660 mg/kg
 Inhalation Rat LC₅₀ For Phosphorus Pentachloride 205 mg/m³
 Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
 Reproductive Effects: None identified.
 Target Organs: Respiratory system, eyes, skin
 Medical Conditions Generally Aggravated By Exposure: None identified
 Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:
 Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation:
 If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store away from water or locations where water may be used to extinguish fire.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water. Do not get water inside container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PHOSPHORUS PENTOXIDE****0140****PRODUCT INFORMATION**

Product Name: Phosphorus Pentoxide

Chinese Name: 五氧化<二>磷

Common Synonyms: Phosphorus (V) Oxide; Phosphorous Pentaoxide; Phosphoric Anhydride

Chemical Family: Phosphorus And Phosphorus Compounds

Formula: P_2O_5

Formula Wt.: 141.94

CAS No.: 1314-56-3

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 360 deg. C (680 deg. F) Vapor Density (Air=1): 4.9
(@ 760 mmHg)
Specific Gravity: 2.38 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Decomposes % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White Crystals. Acid Odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use dry chemical or carbon dioxide. Do not use water.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards:
A violent exothermic reaction occurs with water. Sufficient heat may be produced to ignite combustible materials.

Toxic Gases Produced: Oxides of phosphorus

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles:
Water, ammonia, sodium, potassium, strong bases, most common metals, hydrogen fluoride, alcohols

Decomposition Products: Oxides of phosphorus

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract

Skin Contact: Severe irritation or burns

Eye Contact:

Severe irritation or burns, prolonged contact may cause permanent corneal damage, and blindness, may occur

Skin Absorption: None identified

Ingestion: Severe burns, ulceration - mouth, throat, stomach, nausea, vomiting

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Inhalation-1hr Mouse LC₅₀ For Phosphorus Pentoxide

271 ppm

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Eye contact, skin contact, inhalation, ingestion

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store away from water or locations where water may be used to extinguish fire. Store in a cool, well-ventilated area away from sources of heat, flame, or ignition. Isolate from incompatible materials.

Special Precautions:

Note: keep material dry; reaction with water can generate sufficient heat to ignite materials that burn. Wear goggles, face shield, rubber gloves, and protective clothing when handling. Open container carefully. Do not allow water to get into container because of violent reaction.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM PERCHLORATE****0141****PRODUCT INFORMATION**

Product Name: Potassium Perchlorate
Chinese Name: 高氯酸鉀
Common Synonyms: Perchloric Acid, Potassium Salt
Chemical Family: Potassium Compounds
Formula: KClO_4
Formula Wt.: 138.55
CAS No.: 7778-74-7
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 610 deg. C (1130 deg. F) Vapor Density (Air=1): 4.80
(@ 760 mmHg)
Specific Gravity: 2.52 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Slight (0.1-1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystalline powder.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. When exposed to heat, closed containers may explode; may also give off highly toxic or irritating fumes.

Toxic Gases Produced: Hydrogen chloride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, sources of ignition
Incompatibles: Combustible materials, organic materials, strong reducing agents
Decomposition Products: Hydrogen chloride

HEALTH HAZARD DATA

Inhalation: Irritation of nose and throat
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

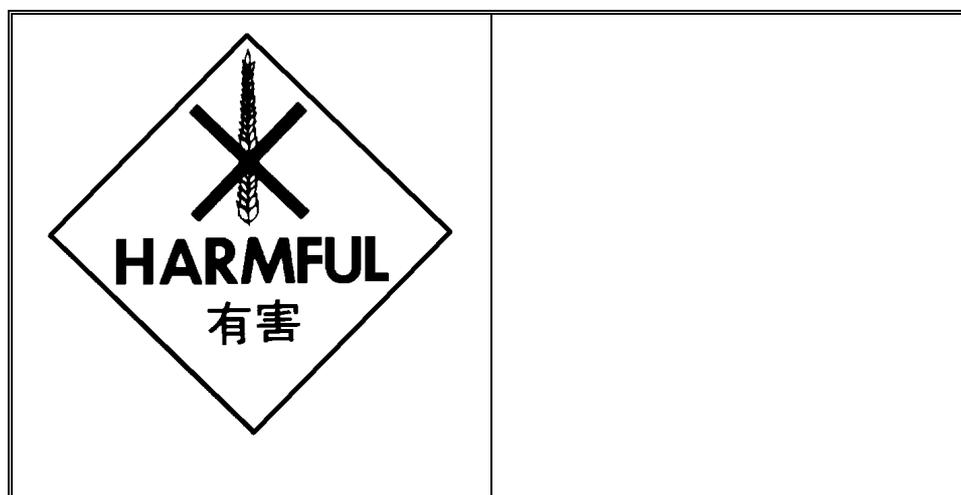
Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS POTASSIUM OXALATE, MONOHYDRATE 0142**PRODUCT INFORMATION**

Product Name: Potassium Oxalate, Monohydrate
Chinese Name: 草酸鉀
Common Synonyms: Ethanedioic Acid, Dipotassium Salt
Chemical Family: Potassium Compounds
Formula: $\text{KOCOCOOK H}_2\text{O}$
Formula Wt.: 184.24
CAS No.: 6487-48-5
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: 2.13
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Strong acids
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract, may cause respiratory system damage
Skin Contact: Severe irritation or burns
Eye Contact: Severe irritation or burns
Skin Absorption: None identified
Ingestion: Irritation and burns to mouth and stomach, nausea, vomiting, unconsciousness, and may be fatal

Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Mucous membranes, gi tract, cardiovascular system, eyes, skin
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in corrosion-proof area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Use water spray to reduce vapors. take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM PERSULFATE****0143****PRODUCT INFORMATION**

Product Name: Potassium Persulfate

Chinese Name: 過二硫酸鉀

Common Synonyms: Potassium Peroxydisulfate; Peroxydisulfuric Acid, Dipotassium Salt

Chemical Family: Potassium Compounds

Formula: $K_2S_2O_8$

Formula Wt.: 270.32

CAS No.: 7727-21-1

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: 2.48
(H₂O=1)
Solubility(H₂O): Moderate (1-10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): 9.30
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Closed containers exposed to heat may explode.

Toxic Gases Produced: Sulfur dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Strong reducing agents, organic materials, combustible materials
Decomposition Products: Oxides of sulfur

HEALTH HAZARD DATA

Inhalation: May be harmful

Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not Established
Short-Term Exposure Limit (STEL): Not Established
Permissible Exposure Limit (PEL): Not Established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes of entry: inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, do not induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact: In case of contact, flush skin with water.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.
Respiratory Protection:
None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.
Eye/Skin Protection: Safety goggles, uniform, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.
Keep product out of light.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) Away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PROPIONALDEHYDE****0144****PRODUCT INFORMATION**

Product Name: Propionaldehyde

Chinese Name: 丙醛

Common Synonyms: Propanal; Propionic Aldehyde; Methylacetaldehyde

Chemical Family: Aldehydes

Formula: $\text{CH}_3\text{CH}_2\text{CHO}$

Formula Wt.: 58.08

CAS No.: 123-38-6

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

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HEALTH HAZARD DATA

Inhalation: Severe irritation of respiratory system, nausea, vomiting

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Irritation and burns to mouth and stomach

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD ₅₀ For Propionaldehyde	1410 mg/kg
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Subcutaneous Rat LD ₅₀ For Propionaldehyde	820 mg/kg
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Skin Rabbit LD ₅₀ For Propionaldehyde	5040 mg/kg
--	------------

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, skin, eyes

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a chemical cartridge respirator with organic vapor cartridge is recommended. If concentration exceeds capacity of cartridge respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area or cabinet.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

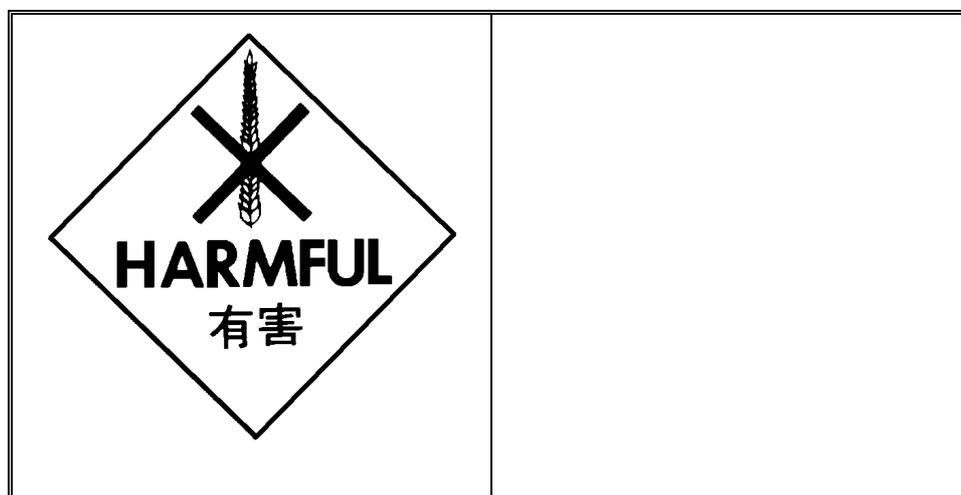
Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**MALONIC ACID****0145****PRODUCT INFORMATION**

Product Name: Malonic Acid
Chinese Name: 丙二酸
Common Synonyms: Propanedioic Acid
Chemical Family: Organic Acids
Formula: $\text{CH}_2(\text{COOH})_2$
Formula Wt.: 104.07
CAS No.: 141-82-2
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 135 deg. C (275 deg. F) Vapor Density (Air=1): 3.6
(@ 760 mmHg)
Specific Gravity: 1.63 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: N/A
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White Crystals.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 157 deg. C (315 deg. F)
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures: None identified.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: None identified
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established

The above information is believed to be accurate to the best of our knowledge.
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Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Malonic Acid

1310 mg/kg

Oral Mouse LD₅₀ For Malonic Acid

4000 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Eye contact, skin contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation:

Call a physician. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SALICYLIC ACID****0146****PRODUCT INFORMATION**

Product Name: Salicylic Acid

Chinese Name: 水楊酸

Common Synonyms: O-Hydroxybenzoic Acid; 2-Hydroxybenzoic Acid

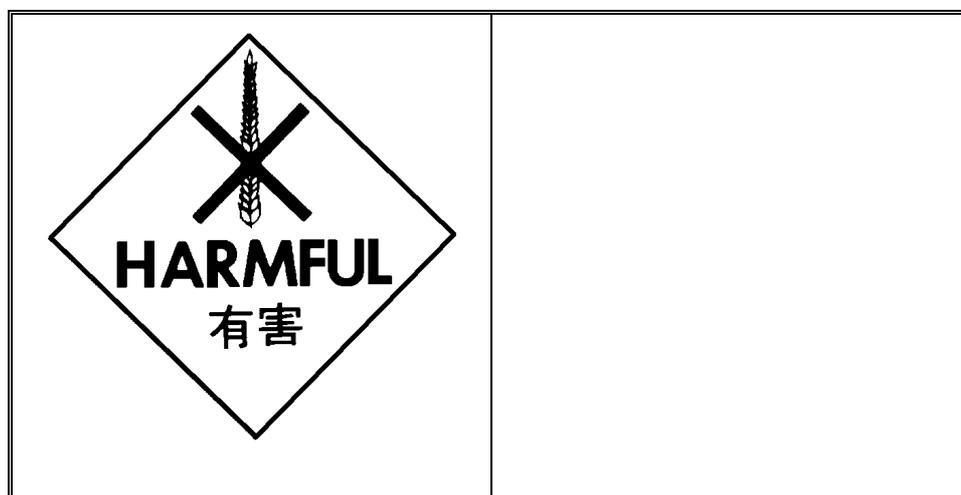
Chemical Family: Organic Acids

Formula: 2-HOC₆H₄COOH

Formula Wt.: 138.12

CAS No.: 69-72-7

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: 211 deg. C (411 deg. F) Vapor Pressure (mmHg): <1
(@ 760 mmHg) (20 deg. C)
Melting Point: 159 deg. C (318 deg. F) Vapor Density (Air=1): 4.8
(@ 760 mmHg)
Specific Gravity: 1.44 Evaporation Rate: <1
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): Slight (0.1-1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 157 deg. C (315 deg. F)
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - 1.1 %
Fire Extinguishing Media: Use water spray, carbon dioxide, dry chemical or ordinary foam.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards: Dust may form explosive mixture with air.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Light, heat, flame, other sources of ignition, moisture
Incompatibles: Strong oxidizing agents, strong bases, mineral acids, iron, most common metals
Decomposition Products: Carbon monoxide, carbon dioxide, phenol

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation, prolonged contact may cause permanent corneal damage, and blindness, may occur

Skin Absorption: None identified

Ingestion: Headache, nausea, vomiting, dizziness, gastrointestinal irritation

Chronic Effects: Kidney damage

Threshold Limit Value (TLV/TWA): 10 mg/m³

TLV is for nuisance dusts and particulates.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 15 mg/m³

PEL is for nuisance dusts and particulates.

Toxicity Of Components:

Oral Rat LD₅₀ For Salicylic Acid 891 mg/kg

Intravenous Mouse LD₅₀ For Salicylic Acid 184 mg/kg

Intraperitoneal Mouse LD₅₀ For Salicylic Acid 1500 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin, respiratory system, gi tract

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Eye contact, skin contact, inhalation, ingestion

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Keep product out of light. Isolate from incompatible materials.

=====
ENVIRONMENTAL PROTECTION DATA
=====

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking, or flames in area. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SILICON TETRACHLORIDE****0147****PRODUCT INFORMATION**

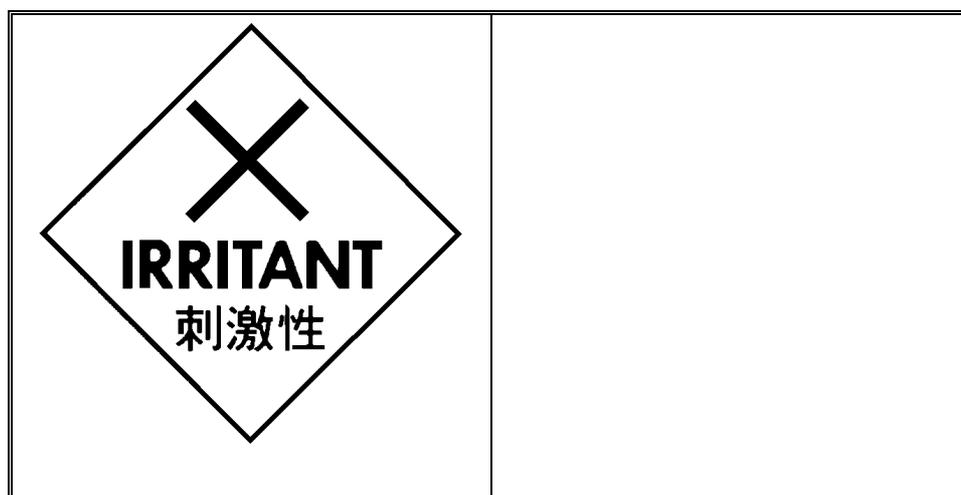
Product Name: Silicon Tetrachloride

Chinese Name: 四氯化硅, 四氯化矽

Synonyms: -

Formula: SiCl_4

Nature, Appearance & Odour: Mobile fuming liquid, colourless, suffocating odour.

RISK SYMBOL**PHYSICAL DATA**

Boiling Point 57.6 deg. C (135.7 deg. F)

Specific Gravity ($\text{H}_2\text{O}=1$ @ 0 deg. C) 1.52 deg. F)

Melting Point -70.0 deg. C (-93 deg. F)

Percent Volatile 100%

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Vapour Pressure (@ 20 deg. C) 26 mmHg)

Evaporation Rate @ 20 deg. C Slow kPa (193

Vapour Density (Air=1) 5.9

Solubility (See Reactivity)

FIRE AND EXPLOSION DATA

Flash Point Non Flammable

Lower Explosive Limit -

Upper Explosive Limit -

Auto Ignition Temperature -

Hazardous Product Of Combustion : Silica, HCl (in contact with moisture)

Extinguishing Media:

Use extinguishing media for surrounding fires. Dry chemicals not containing Alkalies, reacts with water releasing much heat. Contain water used to extinguish fires (may contain hydrochloric acid).

Special Fire Fighting Procedures:

Use SCBA when approaching. Chemical (Acid) resistant clothing to be worn if a leak is present or likely to occur. Cylinders may explode when exposed to fire.

REACTIVITY DATA

Stability : Stable (in absence of moisture, alcohols, amines).

Hazardous Decomposition: May occur under heat or in contact with moisture or Alkali.

Incompatibilities: Water, Alkalies, Alcohol, Acetone

Hazardous Decomposition Products: HCl, Silicic Acid

Corrositivity:

Dry gas will not attach carbon steel. Avoid moisture in cylinders (carbon steel) because cylinder walls may be corroded.

HEALTH HAZARD DATA

Eyes: Severe irritation on exposure.

Skin: Severe irritation and burns on exposure.

Inhalation:

Exposure may cause choking, coughing, edema, spasms of larynx and death may follow severe exposure.

Ingestion: Burns of digestive routes.

FIRST AID MEASURES

Eyes:

Wash promptly with copious amount of water for 15 mins. keeping eye lids apart. Call a physician.
Repeat wash a second time.

Skin:

Move patient from area. Eliminate contaminated clothes and shoes. Call physician. Wash affected areas.
Do not use ointments unless recommended by a physician. Keep patient warm and quiet.

Inhalation:

Move victim to fresh air. Give oxygen if breathing is difficult. Call physician. Give artificial respiration if breathing has stopped. If nose membranes are irritated, wash for 15 minutes.

Ingestion:

Burns may result internally. (Solutions are very strong acid and may cause death).

PREVENTATIVE MEASURES

Ventilation:

Provide good ventilation with suction hoods. Corrosion resistant, forced draft fume hoods preferred.

Hand: Neoprene gloves

Eyes And Face: Full face shield and chemical goggles. Clothing: On possible exposure, neoprene clothes, chemical resistant clothes.

Respiratory Equipment: Self contained breathing apparatus if exposure to vapors is likely to occur.

Storing And Handling:

Store cylinders away from sources of heat. Handle cylinders with cap in place (if supplied).

ENVIRONMENTAL PROTECTION DATA

Spill Or Leak Procedure :

Store with adequate ventilation. In case of leak, close source of spill if without risk. Use full protective clothing on approach. Keep upwind. Evacuate spill area. Reduce vapors with water spray or fog. Do not walk on spilled material unless neutralized or without rubber (neoprene) boots.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODA LIME****0148****PRODUCT INFORMATION**

Product Name: Soda Lime
Chinese Name: 鹼石灰
Common Synonyms: N/A
Chemical Family: Calcium Compounds
Formula: N/A
Formula Wt.: N/A
CAS No.: 8006-28-8
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: N/A
(H₂O=1)
Solubility(H₂O): Slight (0.1-1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White to gray gray odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: ~20
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards: Closed containers exposed to heat may explode.
Toxic Gases Produced: Phosgene, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles: Strong acids, water, fluorine, chloroform, trichloroethylene
Decomposition Products: Phosgene, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Excessive inhalation is irritating, may cause respiratory system damage, coughing
Skin Contact: Severe irritation or burns
Eye Contact: Severe irritation or burns
Skin Absorption: None identified

Ingestion: May be harmful

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 5 mg/m³

TLV is for calcium hydroxide.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Intraperitoneal Mouse LD₅₀ For Sodium Hydroxide 40 mg/kg

Oral Rat LD₅₀ For Potassium Hydroxide 365 mg/kg

Oral Rat LD₅₀ For Calcium Hydroxide 7340 mg/kg

Oral Mouse LD₅₀ For Calcium Hydroxide 7300 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, respiratory system, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water. Follow with diluted vinegar, fruit juice or whites of eggs beaten with water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in corrosion-proof area. Protect from freezing.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS

SODIUM METAL

0149

PRODUCT INFORMATION

Chemical Name : Sodium

Chinese Name: 鈉

Synonyms : Sodium Metal

Chemical Family : Alkali Metal

CAS Number : 7440-23-5

Formula : Na

RISK SYMBOL



PHYSICAL DATA

Boiling Point : 881 deg. C (1,618 deg. F) at 760 mmHg.
Vapor Pressure : 1 mmHg At 493 deg. C (920 deg. F)
Vapor Density : Not applicable
Melting Point : 97.8 deg. C (208 deg. F)
Evaporation Rate : Not applicable
Water Solubility : Reacts violently with water.
Odor : Odorless
Form : Metallic Solid
Specific Gravity : 0.97 @ 20 deg. C (68 deg. F)
pH Information : Reacts with water to form sodium hydroxide (high pH) and hydrogen gas.
Color : In inert atmosphere- pinkish silvery when fresh cut. In air- white to gray.

FIRE AND EXPLOSION DATA

Flash Point : Not applicable
Flammable Limits In Air, % by Volume
LEL : Not determined UEL : Not determined
Autodecomposition: Not applicable
Autoignition : ~120-125 deg. C (~248-257 deg. F)
Fire And Explosion Hazards :
Flammable solid. Reacts violently with water releasing hydrogen gas, which will ignite and explode in air. Burning produces dense, white, irritating smoke.

Extinguishing Media :
Dry Soda Ash, Light (low density, floats on molten sodium) or Class D fire extinguisher. Dry salt or sand is less effective, but can be used.

Special Fire Fighting Instructions :
DO NOT use water. Do not use Carbon Dioxide (CO₂), soda-acid, or chlorinated fire extinguishing agents such as carbon tetrachloride. Stay upwind and use self-contained breathing apparatus if needed. Sodium melts and burns with little or no flame, but with yellow to yellow-orange glowing globules that appear to move on the surface of the molten pool. Reduce fire by diking to limit sodium surface, then smother with soda ash or cover with a steel lid.

REACTIVITY DATA

Instability : Stable.
Decomposition : Decomposition will not occur.

Polymerization : Polymerization will not occur.

Incompatibility :

Reacts violently with any materials containing water and many materials containing oxygen, halides, or active hydrogen. Reaction with water gives sodium hydroxide and hydrogen gas, which may explode.

Burning produces sodium oxide fumes.

HEALTH HAZARD DATA

Causes severe eye and skin burns from reactions to sodium hydroxide--effects may be permanent. Fumes from sodium reactions to sodium oxide may irritate the nose, throat, and lungs. Ingestion will cause burns of the gastrointestinal tract with perforations by formation of sodium hydroxide.

Sodium reacts rapidly with moisture in air or tissues to form sodium hydroxide and sodium oxide. Effects following inhalation, ingestion, or skin or eye contact result from direct chemical reaction with tissue and from thermal reaction with water.

Animal Data:

Oral ALD: 500 mg/kg in rabbits (sodium hydroxide) Sodium is very corrosive to animal skin and eyes by reactive formation of sodium hydroxide. Toxic effects described in animals from exposure by inhalation or ingestion include irritation of the respiratory tract, and extensive necrosis of the gastrointestinal tract.

Human Health Effects:

Overexposure by skin or eye contact include skin burns or ulceration; or eye corrosion with corneal or conjunctival ulceration. By inhalation, the effects include irritation of the upper respiratory passages with coughing and discomfort. By ingestion, the effects include abdominal discomfort characterized by nausea, severe pain, diarrhea, and collapse.

Carcinogenicity :

None of the components in this material is listed by IARC, NTP, OSHA, or ACGIH as a carcinogen.

Exposure Limits :

TLV (ACGIH) : None established

PEL (OSHA) : Particulates not otherwise regulated

15 mg/m₃ - 8 hr TWA - Total dust

5 mg/m₃ - 8 hr TWA - Respirable dust

Safety Precautions :

Persons handling sodium should be thoroughly familiar with its hazards and proper first aid procedures. Do not get in eyes, on skin, or on clothing, and avoid any contact with water. Avoid breathing fumes from sodium reactions.

FIRST AID MEASURES

Inhalation :

If fumes from sodium reactions are inhaled, remove to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Skin Contact :

In case of contact, immediately remove particles of sodium adhering to the body or clothing. This must be done before washing to avoid additional heat from the reaction between sodium and water. After the particles are removed, flush the skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Burn or wash clothing and shoes.

Eye Contact :

In case of contact, remove sodium, then immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

Ingestion :

If swallowed, do not induce vomiting. Give large quantities of water. Call a physician immediately. Never give anything by mouth to an unconscious person.

PREVENTATIVE MEASURES

Generally Applicable Control Measures And Precautions :

Good general ventilation should be provided to keep fume concentrations below the exposure limits and to prevent the accumulation of hydrogen gas.

Personal Protective Equipment :

Solid Sodium: Sodium bricks can be handled safely using chemical splash goggles and DRY moleskin mitts. Mitts should be oversized for easy removal and should extend up the arms to prevent caustic burns. Wear a long sleeve shirt. A full-length face shield, alkali resistant apron, and other special protective equipment may be needed for specific jobs.

Molten Sodium: When liquid sodium is handled or there is danger of spillage, full protective flameproof clothing should be available and used as appropriate. This includes: hard hat with brim; chemical splash goggles; full length face shield; fire resistant ("Nomex" Aramid Fiber or alternative) long underwear, pants and shirt (or coveralls) neck shroud, spats, apron; and heavy duty work shoes. Two, or preferably more, layers of flameproof clothing are clearly more effective than one layer. A NIOSH/MSHA air

supplied or self-contained breathing apparatus is needed if large amounts of sodium oxide smoke are present; a NIOSH/MSHA approved air purifying respirator can be used for smaller amounts.

Store in segregated area of fire resistant, watertight building without sprinklers, steam, water lines, skylights, or potential for flooding. Ventilate to avoid hydrogen accumulation. Keep drums covered to prevent caustic formation from moisture in air. Keep from possible contact with water. Nitrogen purging of open drums will minimize reactions with moisture and oxygen in air. Keep drums tightly closed. Do not store with combustibles or flammables as firefighting problems would be compounded. Use only clean, dry utensils in handling.

ENVIRONMENTAL PROTECTION DATA

Spill, Leak, Or Release :

NOTE: Review FIRE AND EXPLOSION HAZARDS and SAFETY PRECAUTIONS before proceeding with clean up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean up.

Cover with DRY Soda Ash, Light; shovel into a dry metal container and cover again with soda ash, and dispose of promptly. Avoid putting wet sodium in a covered container because a hydrogen explosion may occur. Wear proper protective equipment. Comply with Federal, State, and local regulations on reporting releases. The CERCLA Reportable Quantity is 10 lbs.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM OXALATE****0150****PRODUCT INFORMATION**

Product Name: Sodium Oxalate

Chinese Name: 草酸鈉

Common Synonyms: Oxalic Acid, Disodium Salt; Ethanedioic Acid, Disodium Salt

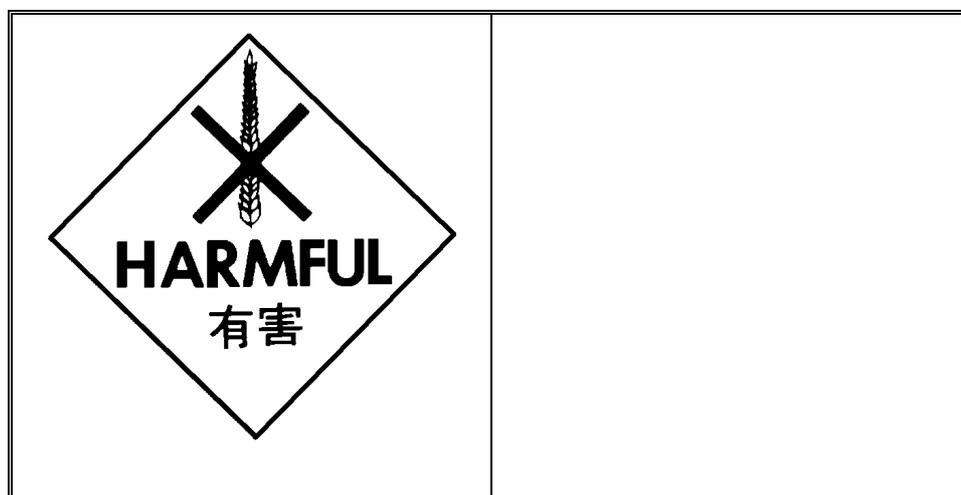
Chemical Family: Organic Sodium Salts

Formula: NaOCOCOONa

Formula Wt.: 134.00

CAS No.: 62-76-0

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: N/A
Melting Point: 260 deg. C (500 deg. F) (@ 760 mmHg)
Specific Gravity: 2.34 (H₂O=1)
Solubility(H₂O): Moderate (1-10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystalline powder. Odorless.

Vapor Pressure (mmHg): N/A
Decomposes Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0 (21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards:
Note: Decomposes at melting point.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: Strong acids
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Severe irritation or burns
Eye Contact: Severe irritation or burns

Skin Absorption: None identified

Ingestion:

Is harmful and may be fatal, nausea, vomiting, unconsciousness, irritation and burns to mouth and stomach

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Chronic Effects: Kidney

Damage Target Organs: Eyes, skin, kidneys

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, if conscious, give lime water, large amount of powdered chalk in water, or milk. Then induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in corrosion-proof area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM FLUORIDE****0151****PRODUCT INFORMATION**

Product Name: Sodium Fluoride

Chinese Name: 氟化鈉

Common Synonyms: Disodium Difluoride; Natrium Fluoride; Floridine; Florocid

Chemical Family: Inorganic Sodium Compounds

Formula: NaF

Formula Wt.: 41.99

CAS No.: 7681-49-4

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: 1704 deg. C (3099 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 993 deg. C (1819 deg. F) Vapor Density (Air=1): 1.4
(@ 760 mmHg)
Specific Gravity: 2.78 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals or powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified. Closed containers exposed to heat may explode.
Toxic Gases Produced: Hydrogen fluoride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Strong acids, glass
Decomposition Products: Hydrogen fluoride

HEALTH HAZARD DATA

Inhalation:
Is harmful and may be fatal, nausea, vomiting, difficult breathing, severe irritation of respiratory system

Skin Contact: Severe irritation or burns

Eye Contact: Severe irritation or burns

Skin Absorption: None identified

Ingestion:

Is harmful and may be fatal, headache, nausea, vomiting, gastrointestinal irritation, convulsions, burns to mouth, throat, and stomach

Chronic Effects: Increased bone density, calcium deposits in ligaments, mottled tooth enamel

Threshold Limit Value (TLV/TWA): 2.5 mg/m³

TLV Is For Fluorides, As F.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 2.5 mg/m³

PEL Is For Fluorides, As F.

Toxicity Of Components:

Oral Rat LD₅₀ For Sodium Fluoride 64 mg/kg

Oral Mouse LD₅₀ For Sodium Fluoride 57 mg/kg

Intraperitoneal Rat LD₅₀ For Sodium Fluoride 22 mg/kg

Intravenous Rat LD₅₀ For Sodium Fluoride 12 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin, respiratory system, lungs, central nervous system, kidneys, gi tract

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

Notes To Physician:

Urinary fluoride excretion levels have been useful in evaluating industrial exposures to fluoride dusts.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in secure poison area. Do not store in glass. Keep away from strong acids.

Special Precautions:

Sodium fluoride reacts with acids to form hydrogen fluoride, which is highly corrosive and poisonous - keep away from strong acids.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM NITRITE****0152****PRODUCT INFORMATION**

Product Name: Sodium Nitrite

Chinese Name: 硝(V)酸鈉

Common Synonyms: Nitrous Acid, Sodium Salt; Anti-Rust

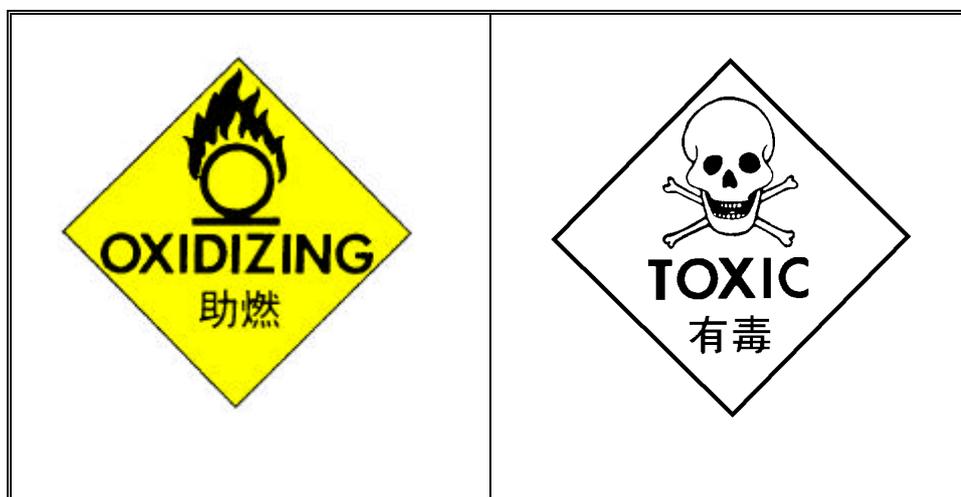
Chemical Family: Inorganic Sodium Compounds

Formula: NaNO_2

Formula Wt.: 69.00

CAS No.: 7632-00-0

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: 320 deg. C (608 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 271 deg. C (519 deg. F) Vapor Density (Air=1): 2.4
(@ 760 mmHg)
Specific Gravity: 2.17 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White to yellow green or purple odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use Water Spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Can react violently with shock, friction or heat.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Shock, friction, heat
Incompatibles:
Cyanides, strong acids, strong reducing agents, combustible materials, organic materials, ammonium salts
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion:

Irritation and burns to mouth and stomach, ingestion of large quantities may cause nausea, vomiting, cyanosis, convulsions, low blood pressure

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

ORAL RAT LD₅₀ For Sodium Nitrite 85 mg/kg

Intraperitoneal Mouse LD₅₀ For Sodium Nitrite 158 mg/kg

Intravenous Rat LD₅₀ For Sodium Nitrite 65 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity:

Nitrosamine formation may occur when sodium nitrite comes in contact with various secondary and tertiary amines. Nitrosamines are potentially carcinogenic compounds.

Reproductive Effects: None identified.

Target Organs: Blood

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

Special Precautions: Material is hygroscopic.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM SULFIDE****0153****PRODUCT INFORMATION**

Chemical Name: Sodium Sulfide

Chinese Name: 硫化鈉

Common Names/Synonyms: Sodium Mono-Sulfide; Sodium Monosulfide Hydrate

CAS No.: 1313-82-2

Formula: $\text{Na}_2\text{S}\cdot\text{XH}_2\text{O}$ **RISK SYMBOL****PHYSICAL DATA**

Boiling Point : 293-349 deg. F

Vapor Pressure, mmHg/20 deg. C: 53

Melting Point : 195-198 deg. F

Vapor Density (Air=1): Not

Applicable Specific Gravity (Water=1): 1.69-1.8

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Water Solubility, %: 20

Evaporation Rate (Butyl Acetate=1): Not applicable

Appearance And Odor: Off-white to salmon-pink to yellow flakes; slight "rotten egg" odor

FIRE AND EXPLOSION DATA

Flash Point : Unknown

Method Used: Not applicable

Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable

Extinguishing Media:

Flood with water. Do not use CO₂ because it may promote generation of flammable, toxic hydrogen sulfide gas.

Special Fire Fighting Procedures:

Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards:

Water sprayed on fire may dissolve sodium sulfide and become highly corrosive, toxic. Flammable hydrogen sulfide gas is evolved on contact with acids. Finely divided dust forms explosive / combustible mixtures in air.

REACTIVITY DATA

Stability: Stable

Polymerization: Will not occur

Conditions To Avoid:

High temperatures, percussion, acidity. Avoid concentrating solutions which could cause spontaneous ignition.

Materials To Avoid:

Acids, oxidizing materials. Avoid contact of solutions with zinc, copper, aluminum, and their alloys.

Hazardous Decomposition Products: Liberates sulfur dioxide gas and hydrogen sulfide gas.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact, inhalation.

Inhalation:

Upon inhalation of dust, toxic hydrogen sulfide is formed the material is extremely corrosive to the entire respiratory tract and causes intense pain and spasms. Sulfide poisoning causes headache, nausea, dizziness, confusion and weakness of the extremities followed by a precipitous lapse into unconsciousness.

Eye Contact:

Dusts are extremely corrosive to the eyes. Brief contact causes severe eye damage and prolonged contact causes permanent eye injury.

Skin Contact:

Dusts are extremely corrosive to the skin and rapidly cause severe chemical burns. Moisture on the skin, such as from per-spiration, will accelerate tissue destruction, may be absorbed through the skin and is moderately to highly toxic by this route of exposure.

Swallowed:

Dusts or solids are extremely corrosive to the mouth and throat. Swallowing dusts or solids causes severe and rapid burning of the mouth, throat, and digestive tract accompanied by severe pain, vomiting and collapse. See inhalation above. The dust is poisonous if swallowed. Gastric acidity would convert this product to hydrogen sulfide gas which is potentially lethal. Burns to the stomach lining may result in severe injury and death.

Chronic Effects Of Exposure:

May cause hypoxic tissue damage to produce neurological deficits like those occurring in survivors of other severe asphyxiant poisonings. The dust is corrosive to body tissues.

Medical Conditions Generally Aggravated By Exposure: None known.

Oral: Rat LD₅₀ = 200 mg/kg

Dermal: Rabbit LD₅₀ > 200 mg/kg

Inhalation: Human LCLO = 600 ppm / 30 min

(This is for hydrogen sulfide gas which is formed upon inhalation of dust.

This amount equals 2,300 ppm sodium sulfide.

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 15 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

If conscious, immediately induce vomiting by giving 2 glasses of water and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

Notes To Physician:

Hydrogen sulfide ion is strongly bound to methemo-globin in a manner similar to cyanide. A dose of sodium nitrite (300 mg., I.v.) for an adult would produce methemoglobin in the blood which would then partially inactivate this poison.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection:

Wear a NIOSH-approved respirator appropriate for the dust concentration at the point of use. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator. Air-purifying cartridge respirators with particulate filters are not appropriate for hydrogen sulfide. If hydrogen sulfide is present, wear a self-contained breathing apparatus or a supplied air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, rubber boots, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry place. Store away from all other chemicals and potential sources of contamination. Do not store in zinc, aluminum or copper containers. Adequate ventilation to remove dust is required.

Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapors. Always obey hazard warnings and handle empty containers as if they were full.

ENVIRONMENTAL PROTECTION DATA

Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped with particulate filters may be satisfactory. In any event, always wear eye protection. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SULPHUR****0154****PRODUCT INFORMATION**

Chemical Name : Sulphur

Chinese Name: 硫

Trade Name and Synonyms : Sulphur; Sulphur Elements

Chemical Family : Sulphur

Chemical Formula : S₈

Molecular Weight : 32

RISK SYMBOL**PHYSICAL DATA**

Physical State : Solid

Odour and Appearance : Yellowish solid; rotten egg odour when H₂S is present

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Odour Threshold (ppm) : N.D.
Specific Gravity : 2.07 @ room temp.
Vapour Pressure (mm) : 0.11 mm Hg @ 140 deg. C
Vapour Density (Air = 1) : .2278 lbs/ft³
Evaporation Rate : N/A
Boiling Point : 445 deg. C
Freezing Point : 110-119 deg. C (melt point)
Solubility in Water (20 deg. C) : Negligible
% Volatile (by volume) : 0
pH : N/A
Coefficient of water/oil distribution : N.D.

FIRE AND EXPLOSION DATA

Conditions of Flammability :

Easily ignitable, combustible solid. Dust or vapour forms explosive mixtures with air.

Means of Extinction :

Small fires may be smothered by covering with inert material such as dirt / sand or use portable extinguisher. For larger fires, use water spray or steam. Avoid spraying water directly into containers due to the danger of boil over.

Special Procedures :

Wear self contained breathing apparatus and full protective equipment. If hydrogen sulfide is present, the flammable limits can range from 4.3 to 45.5% and cause ignition more readily. Avoid straight streams which may scatter molten sulphur and dust.

Flashpoint (deg. C) and Method : 207

Upper explosion limit (% by volume) : N.D

Lower explosion limit (% by volume) : N.D

Auto Ignition Temperature : 232 deg. C

Explosion Data - Sensitivity to Static Discharge : Can be ignited by static

REACTIVITY DATA

Stability : Stable

Incompatibility to other substances : Oxidizing agents, mineral acids and alkalines

Reactivity and under what conditions:

At higher temperatures, sulphur will react with hydrocarbons giving off hydrogen sulphide. Hazardous polymerization will not occur.

Hazardous Decomposition Products: Oxides of sulphur (such as sulphur dioxide), hydrogen sulphide.

HEALTH HAZARD DATA

Exposure limits : LD₅₀/LC₅₀ Specify Species and Route

Route of Entry : Skin Contact, Eye Contact, Inhalation

Effects of Acute Exposure to Product :

Dusts may be irritating to the eyes, nose, throat and lungs. Solid sulphur (especially when freshly produced) may release hydrogen sulphide gas which may cause irritation, breathing failure, coma and death without necessarily any warning odour being sensed. Eye contact with sulfur may be irritating and may injure eye tissue if not removed promptly.

Effects of Chronic Exposure to Product :

Repeated or prolonged contact may irritate the skin, cause dermatitis and lead to allergic reactions. Repeated inhalation exposure to dust may cause bronchitis.

FIRST AID MEASURES

Skin :

Remove contaminated clothing - launder clothing before reuse. Wash skin with soap and running water. Seek medical attention if irritation develops.

Eye : Immediately flush with running water for at least 15 minutes. Seek immediate medical attention.

Inhalation :

Remove to fresh air. If not breathing - apply artificial respiration. Administer oxygen if breathing is difficult. Seek immediate medical attention.

Ingestion :

Do not induce vomiting. Drink milk or water to dilute stomach contents. Never give anything by mouth if victim is convulsing or losing consciousness. Keep warm and at rest. Seek immediate medical attention.

General Advice : Keep victim warm and quiet. Seek medical attention.

PREVENTATIVE MEASURES

Personal Protective Equipment :

Avoid contact with skin, eyes or clothing. if prolonged or repeated skin contact with dust is likely, wear coveralls.

Gloves (Specify) : Chemical resistant.

Eye (Specify) : Chemical goggles.

Respiratory :

Handle with adequate ventilation and wear a dust mask. If adequate ventilation does not exist or, if exposure limits of dust mask are exceeded, wear a NIOSH approved air supplied respirator.

Engineering Controls (e.g. ventilation, enclosed process, specify) :

Local exhaust ventilation may be needed to control dust and vapours below the safe exposure limits.

Handling Procedures and Equipment :

Avoid contact with skin, eyes or clothing. If prolonged or repeated skin contact with dust is likely, wear coveralls. Avoid breathing dust. If hydrogen sulphide or sulphur dioxide is emitted, wear an air supplied respirator when handling. Material may accumulate static. Static charge build up may become an ignition source. Transfer using proper grounding procedures. Guard against dust / vapour accumulation in air. Keep away from heat, sparks or flames.

Storage Requirements :

Store in a cool, well ventilated, dry area at temperatures below 38 deg. C and above 0 deg. C. Protect from physical damage.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure :

Contain. Remove ignition sources. Ventilate area. Wear protective equipment and a NIOSH-approved respirator. Clean up spill creating as little dust as possible. Notify appropriate authorities of significant spills.

Material Safety Data Sheet

City University of Hong Kong

MSDS**1,1,1-TRICHLOROETHANE****0155****PRODUCT INFORMATION**

Product Name: 1,1,1-Trichloroethane

Chinese Name: 1,1,1-三氯乙烷

Common Synonyms: Chloroethene; Methylchloroform; Methyltrichloromethane; Alpha-Trichloroethane

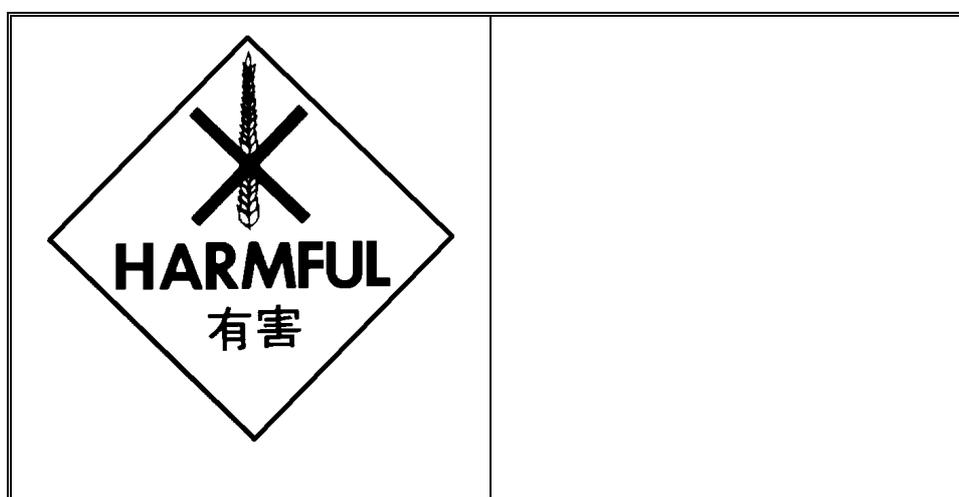
Chemical Family: Chlorinated Hydrocarbons

Formula: CH_3CCl_3

Formula Wt.: 133.41

CAS No.: 71-55-6

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

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Physical State: Liquid
Boiling Point: 74 deg. C (165 deg. F)
(@ 760 mmHg) Vapor Pressure (mmHg): 100
(20 deg. C)
Melting Point: -33 deg. C (-27 deg. F)
(@ 760 mmHg) Vapor Density (Air=1): 4.6
Specific Gravity: 1.32
(H₂O=1) Evaporation Rate: 12.8
(Butyl Acetate = 1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless liquid. Faint ether-like odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - 15.0 % Lower - 7.5 %
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Hydrogen chloride, phosgene, chlorine

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture, insufficient inhibitor, heat, flame, other sources of ignition
Incompatibles: Water, strong bases, aluminum, chemically active metals, strong oxidizing agents
Decomposition Products: Hydrogen chloride, phosgene, chlorine, carbon monoxide

HEALTH HAZARD DATA

Inhalation:

May cause pulmonary edema, headache, nausea, vomiting, dizziness, drowsiness, irritation of upper respiratory tract, unconsciousness

Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Nausea, vomiting

Chronic Effects: Kidney damage, liver damage

Threshold Limit Value (TLV/TWA): 1900 mg/m³ (350 ppm)

Short-Term Exposure Limit (STEL): 2450 mg/m³ (450 ppm)

Permissible Exposure Limit (PEL): 1900 mg/m³ (350 ppm)

Toxicity Of Components:

Oral Rat LD₅₀ For 1,1,1-Trichloroethane

10.3 g/kg

Intraperitoneal Rat LD₅₀ For 1,1,1-Trichloroethane

5100 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Central nervous system, skin, eyes, cardiovascular system

Medical Conditions Generally Aggravated By Exposure: Liver disorders, heart disorders, sensitive skin

Primary Routes Of Entry: Ingestion, inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, do not induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a chemical cartridge respirator with organic vapor cartridge is recommended. If concentration exceeds capacity of cartridge respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, polyvinyl alcohol gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**TURPENTINE****0156****PRODUCT INFORMATION**

Chemical Name: Turpentine

Chinese Name: 松節油, 松脂精

Common Names/Synonyms: Spirits Of Turpentine; Terpene Liquid

CAS No.: 8006-64-2

Formula: Undefined

RISK SYMBOL**PHYSICAL DATA**

Boiling Point : 300-338 deg. F

Vapor Pressure, mmHg/20 deg. C: 4.0

Melting Point : Not Applicable

Vapor Density (Air=1): >1

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Swallowed:

Swallowing large quantities may cause stomach pain, nausea, vomiting, irritation of mouth and throat.

Chronic Effects Of Exposure: No specific information available.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: Rat LD₅₀ - 1.4 to 5.2 g/kg

Dermal: No data found

Inhalation: Rat LC₅₀ - 2430 ppm/6h

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately flush skin with lots of running water for 15 minutes. Remove contaminated clothing and shoes; wash before reuse. Get immediate medical attention.

If Swallowed:

Do not induce vomiting. Get immediate medical attention. If vomiting occurs spontaneously, keep victim's head below his hips to prevent his breathing the vomitus into his lungs.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of maintaining emissions at the point of use below the PEL.

Respiratory Protection:

If use conditions generate vapors or mists, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator equipped for organic vapors/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Safety glasses with side shields. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, rubber gloves, and rubber apron.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Handling And Storage Precautions:

Keep away from heat, sparks, and flames. Store in a cool, dry, well-ventilated place away from incompatible materials. Vent container frequently, and more often in warm weather, to relieve pressure. electrically ground all equipment when handling this product and use only non-sparking tools. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: Do not cut, grind, weld, or drill on or near this container.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapors. Always obey hazard warnings and handle empty containers as if they were full.

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ENVIRONMENTAL PROTECTION DATA
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Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full facepiece air-purifying cartridge respirator equipped for organic vapors may be satisfactory. In any event, always wear eye protection. Extinguish all ignition sources and ensure that all handling equipment is electrically grounded. For small spills or drips, mop or wipe up and dispose of in DOT- approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent materials and then pump into DOT- approved waste containers; or absorb with non-combustible sorbent material, place residue in DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BUTYRIC ACID****0157****PRODUCT INFORMATION**

Product Name: BUTYRIC ACID

Chinese Name: 丁酸

Common Synonyms: N-Butyric Acid; Butanoic Acid; Ethylacetic Acid; Propylformic Acid

Chemical Family: Organic Acids

Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$

Formula Wt.: 88.11

Cas No.: 107-92-6

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: 164 deg. C (327 deg. F) Vapor Pressure (mmHg): 0.84
(@ 760 mmHg) (20 deg. C)
Melting Point: -5 deg. C (23 deg. F) Vapor Density (Air=1): 3.0
(@ 760 mmHg)
Specific Gravity: 0.96 Evaporation Rate: .06
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): Complete (100%) % Volatiles By Volume: N/A
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless liquid. Suffocating odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 71 deg. C (160 deg. F)
Autoignition Temperature: N/A
Flammable Limits: Upper - 13.4 % Lower - 2.2 %
Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards:
Vapors may flow along surfaces to distant ignition sources and flash back. closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.

Toxic Gases Produced: carbon monoxide, carbon dioxide, hydrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, sources of ignition
Incompatibles: Strong oxidizing agents, aluminum, most common metals, alkalies
Decomposition Products: Hydrogen, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of mucous membranes, severe irritation of respiratory system, nausea
 Skin Contact: Irritation, burns
 Eye Contact: Irritation, burns
 Skin Absorption: Rapid absorption
 Ingestion: Irritation and burns to mouth and stomach
 Chronic Effects: None identified
 Threshold Limit Value (TLV/TWA): Not established
 Short-Term Exposure Limit (STEL): Not established
 Permissible Exposure Limit (PEL): Not established
 Toxicity Of Components:
 Oral Rat LD₅₀ For Butyric Acid 2940 mg/kg
 Intraperitoneal Mouse LD₅₀ For Butyric Acid 3180 mg/kg
 Skin Rabbit LD₅₀ For Butyric Acid 530 mg/kg
 Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Eye contact, skin contact, ingestion, inhalation, absorption

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, if conscious, give large amounts of water. Induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a chemical cartridge respirator with organic vapor cartridge is recommended. If concentration exceeds capacity of cartridge respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area or cabinet.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ACETALDEHYDE****0158****PRODUCT INFORMATION**

Product Name: Acetaldehyde

Chinese Name: 乙醛

Common Synonyms: Ethanal; Ethyl Aldehyde; Acetic Aldehyde

Chemical Family: Aldehydes

Formula: CH_3CHO

Formula Wt.: 44.05

CAS No.: 75-07-0

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Liquid
Boiling Point: 20 deg. C (68 deg. F) Vapor Pressure (mmHg): 750
(@ 760 mmHg) (20 deg. C)
Melting Point: -124 deg. C (-191 deg. F) Vapor Density (Air=1): 1.52
(@ 760 mmHg)
Specific Gravity: 0.78 Evaporation Rate: 49
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): Complete (100%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Clear, colorless liquid. Pungent odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): -37 deg. C (-36 deg. F)
Autoignition Temperature: 174 deg. C (347 deg. F)
Flammable Limits: Upper - 60.0 % Lower - 4.0 %
Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Vapors may flow along surfaces to distant ignition sources and flash back. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire. Rapid, uncontrolled polymerization can cause fire or explosion. May form explosive peroxides, especially when heated.

Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: May occur
Conditions To Avoid: Heat, flame, other sources of ignition, air
Incompatibles:
Strong oxidizing agents, strong bases, amines and ammonia, strong acids, polymerization catalysts & accelerators, acid anhydrides, alcohols, ketones, phenols, halogens, hydrogen cyanide, hydrogen sulfide
Decomposition Products: Carbon monoxide, carbon dioxide, explosive peroxides

HEALTH HAZARD DATA

Inhalation:

Irritation of mucous membranes, headache, nausea, vomiting, dizziness, drowsiness, narcosis, severe irritation of respiratory system, pulmonary edema, unconsciousness

Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Severe irritation or burns, may cause temporary corneal damage

Skin Absorption: None identified

Ingestion:

Headache, nausea, vomiting, dizziness, gastrointestinal irritation, central nervous system depression, severe burns to mouth, throat, and stomach, respiratory failure, unconsciousness

Chronic Effects: Central nervous system depression, damage to liver, kidneys, and blood

Threshold Limit Value (TLV/TWA): 180 mg/m³ (100 ppm)

Short-Term Exposure Limit (STEL): 270 mg/m³ (150 ppm)

Permissible Exposure Limit (PEL): 180 mg/m³ (100 ppm)

TOXICITY OF COMPONENTS:

Oral Rat LD₅₀ For Acetaldehyde 1930 mg/kg

Subcutaneous Rat LD₅₀ For Acetaldehyde 640 mg/kg

Intravenous Mouse LD₅₀ For Acetaldehyde 212 g/kg

Inhalation-4hr Mouse LC₅₀ For Acetaldehyde 1500 ppm

Carcinogenicity: NTP: No IARC: Yes Z LIST: No OSHA REG: No

Carcinogenicity: This substance is listed as an IARC animal carcinogen.

Reproductive Effects: Tests on laboratory animals indicate material may be mutagenic and teratogenic.

Target Organs: Respiratory system, lungs, skin, liver, kidneys, blood, central nervous system

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, if conscious, give large amounts of water. Induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

Notes To Physician: Signs and symptoms of pulmonary edema can be delayed for several hours.

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PREVENTATIVE MEASURES

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Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 1000 ppm, a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area. Product must be refrigerated at 2 - 8 deg. C (36 - 46 deg. F). Isolate from incompatible materials.

Special Precautions: Bond and ground containers when transferring liquid.

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ENVIRONMENTAL PROTECTION DATA

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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ALUMINUM OXIDE****0159****PRODUCT INFORMATION**

Product Name: Aluminum Oxide
Chinese Name: 氧化鋁
Common Synonyms: Alumina
Chemical Family: Aluminum Compounds
Formula: Al_2O_3
Formula Wt.: 101.96
CAS No.: 1344-28-1
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: 2977 deg. C (5390 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 2030 deg. C (3686 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 4.00 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures: None identified.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: None identified
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation:
Tightness and pain in chest, coughing, difficult breathing, excessive inhalation is irritating, may cause respiratory tract ulcers

Skin Contact: Irritation
Eye Contact: Irritation

Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None Identified
Threshold Limit Value (TLV/TWA): 10 mg/m³
TLV Is For Aluminum, Metal And Oxides, As Al.
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): 10 mg/m³
The Pel For Aluminum Oxide Is Listed Under Alpha-Alumina, Total Dust.
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: Lung disease
Primary Routes Of Entry: Inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS ALUMINUM SULFATE, 18-HYDRA 0160
CRYSTAL

PRODUCT INFORMATION

Product Name: Aluminum Sulfate, 18-Hydrate, Crystal

Chinese Name: 硫(VI)酸鋁

Common Synonyms: Cake Alum; Patent Alum

Chemical Family: Aluminum Compounds

Formula: $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$

Formula Wt.: 666.42

CAS No.: 7784-31-8

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Boiling Point: N/A

Vapor Pressure (mmHg): N/A

Melting Point: 86 deg. C (186 deg. F) Decomposes Vapor Density (Air=1): N/A
(@ 760 mmHg)

Specific Gravity: 1.62
(H₂O=1)

Evaporation Rate: N/A

Solubility(H₂O): Appreciable (>10%)

% Volatiles By Volume: 0
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: White crystalline solid. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: Note: decomposes at melting point.

Toxic Gases Produced: Sulfur dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Moisture

Incompatibles: Most common metals

Decomposition Products: Oxides of sulfur, sulfuric acid

HEALTH HAZARD DATA

Inhalation: Tightness and pain in chest, coughing, difficult breathing

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Nausea, vomiting, gastrointestinal irritation

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 2 mg/m³

TLV Is For Aluminum, Soluble Salts, As Al.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Mouse LD₅₀ For Aluminum Sulfate, 18-Hydrate

6207 mg/kg

Intraperitoneal Mouse LD₅₀ For Aluminum Sulfate, 18-Hydrate

270 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**AMMONIUM CARBONATE****0161****PRODUCT INFORMATION**

Product Name: Ammonium Carbonate

Chinese Name: 碳酸銨

Common Synonyms: Carbonic Acid, Ammonium Salt; Diammonium Carbonate

Chemical Family: Ammonium Salts

Formula: $(\text{NH}_4)_2\text{CO}_3$

Formula Wt.: 96

CAS No.: 506-87-6

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: N/A Vapor Density (Air=1): 2.7
Specific Gravity: 1.50 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White powder. Ammonia odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Ammonia, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Strong acids, nitrates, nickel, copper
Decomposition Products: Ammonia, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of nose and throat, tightness and pain in chest, coughing, difficult breathing
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified

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Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Intravenous Mouse LD₅₀ For Ammonium Carbonate

96 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, nitrile gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Store below 30 deg. C.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**AMMONIUM CHLORIDE****0162****PRODUCT INFORMATION**

Product Name: Ammonium Chloride

Chinese Name: 氯化銨

Common Synonyms: Sal Ammoniac

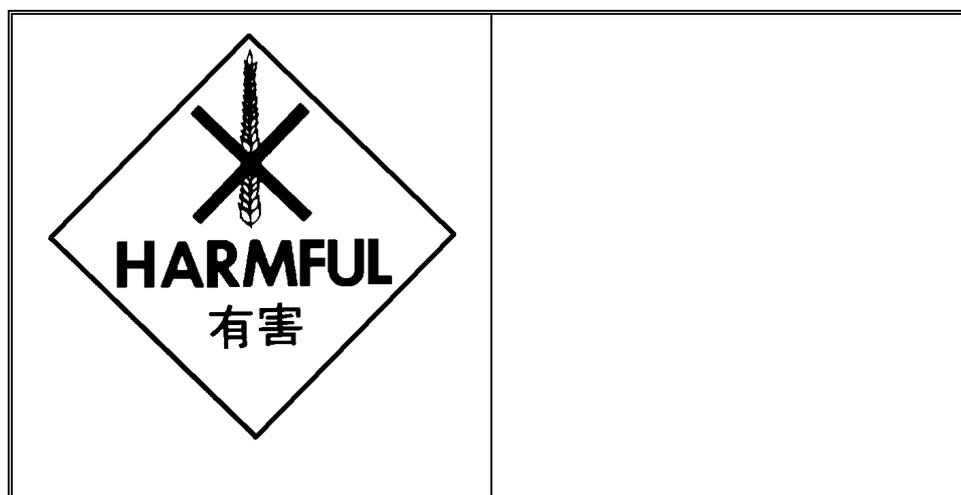
Chemical Family: Ammonium Salts

Formula: NH_4Cl

Formula Wt.: 53.49

CAS No.: 12125-02-9

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 338 deg. C (640 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 1.53 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals or granules. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Ammonia, hydrogen chloride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture, heat
Incompatibles:
Strong oxidizing agents, strong acids, strong bases, most common metals, bromine trifluoride and trichloride, silver and silver compounds

Decomposition Products: Ammonia, hydrogen chloride

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract

The above information is believed to be accurate to the best of our knowledge.
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Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Nausea, vomiting, irritation and burns to mouth and stomach

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 10 mg/m³

Short-Term Exposure Limit (STEL): 20 mg/m³

Permissible Exposure Limit (PEL): 10 mg/m³

Toxicity Of Components:

Oral Rat LD₅₀ For Ammonium Chloride 1650 mg/kg

Intraperitoneal Mouse LD₅₀ For Ammonium Chloride 485 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

one required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**AMMONIUM SULFATE****0163****PRODUCT INFORMATION**

Product Name: Ammonium Sulfate

Chinese Name: 硫(VI)酸銨

Common Synonyms: Sulfuric Acid, Diammonium Salt; Diammonium Sulfate

Chemical Family: Ammonium Salts

Formula: $(\text{NH}_4)_2\text{SO}_4$

Formula Wt.: 132.14

CAS No.: 7783-20-2

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 280 deg. C (536 deg. F) Decomposes Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 1.77 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals or granules. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards:
Contact with strong oxidizers may cause fire or explosion. note: decomposes at melting point.
Toxic Gases Produced: Ammonia, sulfur dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Strong oxidizing agents, copper, brass, bronze, strong acids
Decomposition Products: Ammonia, oxides of sulfur

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Prolonged contact may cause irritation

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Gastrointestinal irritation

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Ammonium Sulfate

3000 mg/kg

Intraperitoneal Mouse LD₅₀ For Ammonium Sulfate

610 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, lungs

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

one required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are Recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Do not store near oxidizing materials.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ANTIMONY TRICHLORIDE****0165****PRODUCT INFORMATION**

Product Name: Antimony Trichloride

Chinese Name: 氯化銻(III)

Common Synonyms: Antimony (III) Chloride; Butter Of Antimony; Trichlorostibine

Chemical Family: Antimony Compounds

Formula: SbCl_3

Formula Wt.: 228.11

CAS No.: 10025-91-9

Product Use: Laboratory Reagent

RISK SYMBOL

PHYSICAL DATA

Physical State: Solid

Boiling Point: 223 deg. C (433 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)

Melting Point: 73 deg. C (163 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)

Specific Gravity: 3.14 Evaporation Rate: N/A
(H₂O=1)

Solubility(H₂O): Hydrolyses % Volatiles By Volume: 0
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: Colorless or white needle-like crystals. Acetic acid odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use dry chemical or carbon dioxide. Do not use water.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.

Toxic Gases Produced: Chlorine, hydrogen chloride

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Moisture

Incompatibles: Aluminum, alkali metals, water

Decomposition Products: Hydrogen chloride

HEALTH HAZARD DATA

Inhalation:

Headache, coughing, difficult breathing, chest pains, severe lung irritation, pulmonary edema

Skin Contact: Severe irritation or burns

Eye Contact: Severe irritation or burns

Skin Absorption: None identified

Ingestion: Nausea, vomiting, irritation and burns to mouth and stomach

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 0.5 mg/m³

TLV Is For Antimony & Compounds, As Sb.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.5 mg/m³

PEL Is For Antimony And Compounds, As Sb.

Toxicity Of Components:

Oral Rat LD₅₀ For Antimony Trichloride 525 mg/kg

Oral Guinea Pig LD₅₀ For Antimony Trichloride 574 mg/kg

Intraperitoneal Mouse LD₅₀ For Antimony Trichloride 13 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, cardiovascular system, eyes, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, eye contact, skin contact, ingestion

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in corrosion-proof area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

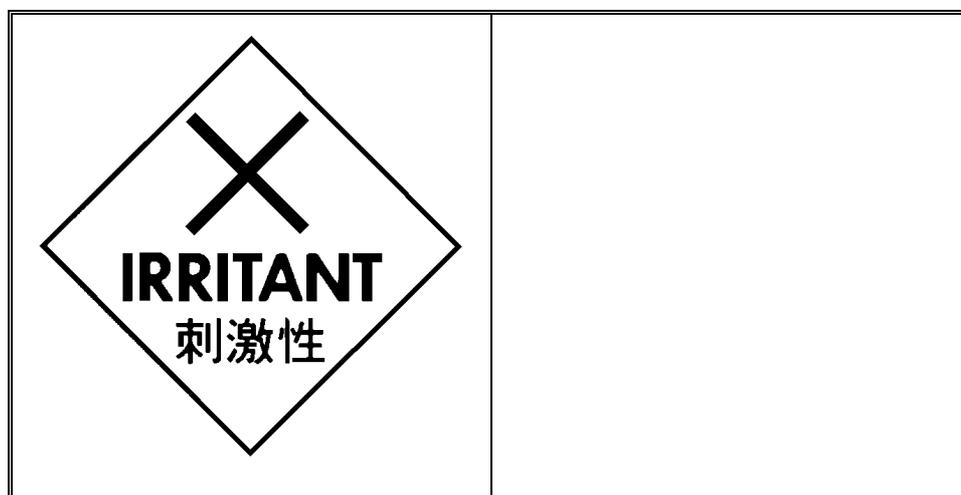
Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BISMUTH TRICHLORIDE****0166****PRODUCT INFORMATION**

Product Name: Bismuth Trichloride
Chinese Name: 氯化鉍(III)
Common Synonyms: Bismuth (III) Chloride
Chemical Family: Bismuth Compounds
Formula: BiCl_3
Formula Wt.: 315.34
CAS No.: 7787-60-2
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: 447 deg. C (836 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 227 deg. C (440 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 4.56 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Decomposes % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White to yellow crystals. Hydrochloric acid odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Hydrogen chloride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles: Water
Decomposition Products: Hydrogen chloride

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified

Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: Kidney damage, liver damage
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None Indicated

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in secure poison area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS BISMUTH NITRATE, 5-HYDRATE 0167**PRODUCT INFORMATION**

Product Name: Bismuth Nitrate, 5-Hydrate

Chinese Name: 硝(V)酸鉍(III)

Common Synonyms:

Bismuth (III) Nitrate, 5-Hydrate; Nitric Acid, Bismuth (3+) Salt, 5-Hydrate

Chemical Family: Bismuth Compounds

Formula: $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$

Formula Wt.: 485.07

CAS No.: 10035-06-0

Product Use: Laboratory Reagent

RISK SYMBOL

PHYSICAL DATA

Physical State: Solid

Boiling Point: N/A

Melting Point: N/A

Specific Gravity: 2.83
(H₂O=1)

Solubility(H₂O): Decomposes

Vapor Pressure (mmHg): N/A

Vapor Density (Air=1): N/A

Evaporation Rate: N/A

% Volatiles By Volume: 0
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: White crystals. Acid odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use water spray.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:

Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Heat, moisture

Incompatibles: Organic materials, combustible materials, strong reducing agents, water

Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: May be harmful
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

Special Precautions: Material is hygroscopic.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS CALCIUM NITRATE, 4-HYDRATE 0169**PRODUCT INFORMATION**

Product Name: Calcium Nitrate, 4-Hydrate

Chinese Name: 硝(V)酸鈣

Common Synonyms: Calcium (II) Nitrate, Tetrahydrate; Nitric Acid, Calcium Salt, Tetrahydrate

Chemical Family: Calcium Compounds

Formula: $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$

Formula Wt.: 236.15

CAS No.: 13477-34-4

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 45 deg. C (113 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 1.82 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Can react violently with shock, friction or heat.

Toxic Gases Produced: Oxides of nitrogen
Explosion Data-Sensitivity To Mechanical Impact: Yes.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, shock
Incompatibles: Combustible materials, strong reducing agents, organic materials, ammonia
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: Gastrointestinal irritation, nausea, vomiting
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Oral Rat LD₅₀ For Calcium Nitrate, 4-Hydrate 3900 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Eyes, skin
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Skin contact, eye contact, inhalation, ingestion

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

Special Precautions:

Do not expose to heat. Product melts at 45 deg. C (113 deg. F). Store/transport at or below 30 deg. C (86 deg. F).

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CALCIUM OXIDE****0170****PRODUCT INFORMATION**

Product Name: Calcium Oxide

Chinese Name: 氧化鈣

Common Synonyms: Lime; Calx; Quicklime; Calcium Monoxide; Burnt Lime

Chemical Family: Calcium Compounds

Formula: CaO

Formula Wt.: 56.08

CAS No.: 1305-78-8

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: 2850 deg. C (5162 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 2572 deg. C (4661 deg. F) Vapor Density (Air=1): 1.9
(@ 760 mmHg)
Specific Gravity: 3.34 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White to gray solid. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures: None identified.
Unusual Fire & Explosion Hazards:
Contact with moisture or water may generate sufficient heat to ignite combustible materials.

Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture, air
Incompatibles: Water, fluorine, strong acids
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: Tightness and pain in chest, coughing, difficult breathing
Skin Contact: Severe irritation or burns
Eye Contact: Severe irritation or burns
Skin Absorption: None identified

Ingestion: Irritation and burns to mouth and stomach
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): 2 mg/m³
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): 5 mg/m³
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Respiratory system, lungs, kidneys, prostate, blood
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water. Follow with diluted vinegar, fruit juice or whites of eggs beaten with water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Skin contact: in case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 11 ppm, a dust/mist respirator is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Store in a dry area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**CALCIUM, TURNINGS****0171****PRODUCT INFORMATION**

Product Name: Calcium, Turnings

Chinese Name: 鈣鈹片, 碎鈣片

Common Synonyms: N/A

Chemical Family: Metals

Formula: Ca

Formula Wt.: 40.08

CAS No.: 7440-70-2

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 850 deg. C (1562 deg. F) Vapor Density (Air=1): 1.4
(@ 760 mmHg)
Specific Gravity: 1.57 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Silvery-white crystals.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Smother with dry soda ash. Never use water or chemical fire extinguishers.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move exposed containers from fire area, if it can be done without risk. Use water to keep fire exposed containers cool; do not get water inside containers.
Unusual Fire & Explosion Hazards: Reacts violently with water liberating and igniting hydrogen.
Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture, heat, flame, other sources of ignition
Incompatibles: Water
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Severe irritation or burns
Eye Contact: Severe irritation or burns

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Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Skin contact, eye contact

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:
In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:
None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in cool, dry, well-ventilated area away from heat, sparks, or flame.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Shut off ignition sources; no flares, smoking, or flames in area. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water. Do not put any water on leak or spills.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CITRIC ACID****0172**

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PRODUCT INFORMATION

Chemical Name: Citric Acid Anhydrous

Chinese Name: 檸檬酸

Chemical Family: Organic Acid

Molecular Formula: $\text{HOC}(\text{CH}_2\text{CO}_2\text{H})_2\text{CO}_2\text{H}$

C.A.S. : 77-92-9

Product Use:

Preparation of citrates, flavouring extracts, confections, soft drinks, effervescent salts, acidifier, dispersing agent, medicines, acidulant and anti oxidant in foods, sequestering agent, water conditioning agent, detergent builder, cleaning and polishing stainless steel and other metals, alkyd resins, mordant, removal of sulfur dioxide from smelter waste gases, abscission of citrus fruit in harvesting, cultured dairy products.

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RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Odour And Appearance: White crystals, odourless.

Odour Threshold: Not available

Vapour Pressure: Not applicable

Evaporation Rate: Not applicable

Boiling Point: Not applicable

Solubility In Water: 60% at 20 deg. C Soluble

Specific Gravity: 1.665

Bulk Density: 1.665

Coefficient Of Water/Oil Distribution: Not applicable

Vapour Density: Not applicable

pH: of 0.1 N solution is 2.2

Melting Point: 153 deg. C

Molecular Weight: 192.14

Volatile By Volume: Not applicable

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Not applicable

Flash Point: Nonflammable

Upper Flammable Limit: Not available

Lower Flammable Limit: Not available

Auto Ignition Temperature: Not available

Hazardous Combustion Products: Not available

Special Fire Fighting Procedures:

Firefighters should wear the usual protective gear; self-contained breathing apparatus.

Explosion Hazards: Not available

REACTIVITY DATA

Stability: Very stable

Hazardous Polymerization: Will not occur

Incompatibility: Alkali metals, organic acids, oxides of sulphur, strong bases.

Hazardous Reactions/Decompositions: Carbon monoxide, carbon dioxide.

Conditions To Avoid: Contact with incompatibles.

HEALTH HAZARD DATA

Inhalation: Dust may irritate the nose and throat.

Skin Contact: May cause irritation.

Eye Contact: May cause eye irritation.

Ingestion: Irritation of mucous membranes. May cause gastrointestinal irritation.

Chronic Exposure Effects:

Non-toxic, non-volatile, non-hazardous nuisance dust symptoms, low risk allergen.

Exposure Limits: Not available

Irritancy: See above

Mutagenicity: None known

Carcinogenicity: None known

Sensitization To Product: Not available

Reproductive Toxicity: None known

Toxicologically Synergistic Materials: None known

Teratogenicity Data: Not available

Animal Toxicity Data: LD₅₀,Route,Specie 6730 mg/kg,oral,rats

LC₅₀,Route,Specie not available

FIRST AID MEASURES

Inhalation: Remove to fresh air. Give artificial respiration if necessary. Call Physician.

Skin Contact:

Immediately flush skin with water for 15 min. Remove contaminated clothing. Seek medical attention.

Eye Contact: Immediately flush eyes with water for 15 min. Call physician.

Ingestion: Give large quantities of water or milk. Call physician.

PREVENTATIVE MEASURES

Respiratory Protection: Wear dust mask.

Skin Protection: Wear impervious protective clothing.

Eye/Face Protection: Chemical goggles.

Special Handling Procedures: Avoid all skin contact

Storage Requirements: Keep containers closed when not in use. Store in a cool and Well ventilated area.

Engineering Controls: Ventilate adequately.

ENVIRONMENTAL PROTECTION DATA

Steps In The Event Of A Leak Or Spill:

Contain the spill. Pick up solids and place in a tightly sealed container.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD DIOXIDE****0173****PRODUCT INFORMATION**

Product Name: Lead Dioxide

Chinese Name: 氧化鉛(IV)

Common Synonyms: Lead (IV) Oxide; Lead Peroxide; Lead Brown; Lead Oxide Brown

Chemical Family: Lead Compounds

Formula: PbO_2

Formula Wt.: 239.19

CAS No.: 1309-60-0

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: 9.38
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Dark brown powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): 8.2
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Can react violently with shock, friction or heat.

Toxic Gases Produced: Lead fumes

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Shock, friction, heat
Incompatibles: Strong reducing agents, combustible materials, organic materials, chemically active metals
Decomposition Products: Lead Fumes

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Inhalation: Irritation of upper respiratory tract

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion:

Headache, nausea, vomiting, gastrointestinal irritation, convulsions, unconsciousness, and may be fatal

Chronic Effects: Anemia, kidney damage, blurred vision, lead build-up in the central nervous system

Threshold Limit Value (TLV/TWA): 0.15 mg/m³

TLV Is For Lead, Inorganic Dusts And Fumes, As Pb.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.05 mg/m³

PEL Is For Lead, Inorganic Dusts And Fumes, As Pb.

Toxicity Of Components:

Intraperitoneal Guinea Pig LD₅₀ For Lead Dioxide

220 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: YES

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Gi tract, central nervous system, gingival tissue, kidneys, blood

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

one required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a high-efficiency particulate respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS MERCURIC NITRATE, MONOHYDRATE 0174**PRODUCT INFORMATION**

Product Name: Mercuric Nitrate, Monohydrate

Chinese Name: 硝(V)酸汞(II)

Common Synonyms: Mercury (II) Nitrate; Mercury Pernitrate; Nitric Acid, Mercury (II) Salt

Chemical Family: Mercury Compounds

Formula: $\text{Hg}(\text{NO}_3)_2 \cdot \text{nH}_2\text{O}$

Formula Wt.: 342.62

CAS No.: 7783-34-8

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 79 deg. C (174 deg. F) Vapor Density (Air=1): 11.0
(@ 760 mmHg)
Specific Gravity: 4.30 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White to yellow crystalline powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use Water Spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Can react violently with shock, friction, or heat. Note: decomposes at boiling point.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, shock, friction, dusting
Incompatibles: Combustible materials, organic materials, strong reducing agents, hydrophosphorous acid
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation:

Is harmful and may be fatal, irritation of upper respiratory tract, nausea, vomiting, gastrointestinal irritation

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: Rapid absorption

Ingestion:

Is harmful and may be fatal, nausea, vomiting, gastrointestinal irritation, burns to mouth and throat
 chronic effects: mercury build-up in the brain, liver, and kidneys, headache, shakes, loose teeth, loss of appetite, skin ulceration, impaired memory

Threshold Limit Value (TLV/TWA): 0.1 mg/m³

TLV (Skin) Is For Mercury, Aryl And Inorganic Compounds, As Hg.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.1 mg/m³

PEL (Ceiling-Skin) Is For Mercury (Aryl And Inorganic Compounds), As Hg.

Toxicity Of Components:

Oral Rat LD₅₀ For Mercuric Nitrate 51.4 mg/kg

Oral Mouse LD₅₀ For Mercuric Nitrate 29.1 mg/kg

Intraperitoneal Mouse LD₅₀ For Mercuric Nitrate 8 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin, respiratory system, lungs, liver, kidneys, central nervous system, teeth

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, absorption, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials. Isolate from incompatible materials. Keep product out of light.

Special Precautions: Material is hygroscopic.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) Away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS MERCUROUS NITRATE, DIHYDRATE 0175**PRODUCT INFORMATION**

Product Name: Mercurous Nitrate, Dihydrate

Chinese Name: 硝(V)酸汞(I)

Common Synonyms: Mercury (I) Nitrate, Dihydrate; Nitric Acid, Mercury (I) Salt, Dihydrate

Chemical Family: Mercury Compounds

Formula: $\text{Hg}_2(\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$

Formula Wt.: 561.22

CAS No.: 14836-60-3

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: 4.78
(H₂O=1)
Solubility(H₂O): Complete (100%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless crystals. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): 1.90
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Closed containers exposed to heat may explode.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Most common metals, combustible materials, strong reducing agents
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 0.1 mg/m³

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Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Mercurous Nitrate, Dihydrate

182 mg/kg

Intraperitoneal Mouse LD₅₀ For Mercurous Nitrate, Dihydrate

5 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Inhalation: Headache, coughing, dizziness, difficult breathing

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: None identified, nausea, vomiting, dizziness, unconsciousness

Chronic Effects:

Mercury build-up in the brain, liver, and kidneys, headache, shakes, loose teeth, loss of appetite, skin ulceration, impaired memory

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

one required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.
Keep containers out of sun and away from heat.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**MERCURIC OXIDE, RED****0176****PRODUCT INFORMATION**

Product Name: Mercuric Oxide, Red
Chinese Name: 氧化汞(II)
Common Synonyms: Mercury (II) Oxide, Red
Chemical Family: Mercury Compounds
Formula: HgO
Formula Wt.: 216.59
CAS No.: 21908-53-2
Product Use: Laboratory reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (MmHg): N/A
Melting Point: 500 deg. C (932 deg. F) Decomposes Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 11.1 Evaporation Rate: 0.6
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Orange to red powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards:
Note: decomposes at melting point. Can react violently with shock, friction or heat.

Toxic Gases Produced: Carbon monoxide, carbon dioxide, mercury fumes

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Light, heat
Incompatibles:
Strong reducing agents, strong oxidizing agents, amines, combustible materials, organic materials, phenol

Decomposition Products: Mercury fumes, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: May be fatal, tightness and pain in chest, coughing, difficult breathing

Skin Contact: Severe irritation or burns, prolonged contact may cause skin sensitization

Eye Contact:

Severe irritation or burns, prolonged contact may cause permanent corneal damage, and blindness, may occur

Skin Absorption: May be fatal, rapid absorption

Ingestion: May be fatal, nausea, vomiting, gastrointestinal irritation, burns to mouth and throat

Chronic Effects:

Mercury build-up in the brain, liver, and kidneys, headache, shakes, loose teeth, loss of appetite, skin ulceration, impaired memory

Threshold Limit Value (TLV/TWA): 0.1 mg/m³

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.1 mg/m³

PEL Listed Denotes Ceiling Limit.

Toxicity Of Components:

Oral Rat LD₅₀ For Mercuric Oxide

18 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin, respiratory system, central nervous system, kidneys

Medical Conditions Generally Aggravated By Exposure:

Allergies, chronic respiratory disease, nerve system disorders, kidney disorders

Primary Routes Of Entry: Inhalation, absorption, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep product out of light. Keep container tightly closed. Store in secure poison area. Store in light-resistant containers.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PARAFFIN OIL****0177****PRODUCT INFORMATION**

Product Name: Paraffin Oil

Chinese Name: 石蠟油

Common Synonyms: Mineral Oil; White Mineral Oil; Nujol

Chemical Family: Oils

Formula: N/A

Formula Wt.: N/A

CAS No.: 8012-95-1

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

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Physical State: Liquid

Boiling Point: N/A

Vapor Pressure (mmHg): <0.5
(20 deg. C)

Melting Point: -18 deg. C (-0 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)

Specific Gravity: 0.88 Evaporation Rate: N/A
(H₂O=1)

Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: Clear, colorless viscous liquid. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 215 deg. C (420 deg. F)

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards: None identified.

Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Heat, flame

Incompatibles: Strong oxidizing agents, chlorine

Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation:

Irritation of mucous membranes, headache, nausea, vomiting, dizziness, drowsiness, irritation of upper respiratory tract, unconsciousness

Skin Contact: Prolonged contact may cause irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Nausea, vomiting, diarrhea

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 5 mg/m³

TLV Is For Oil Mist, Mineral.

Short-Term Exposure Limit (STEL): 10 mg/m³

STEL Is For Oil Mist, Mineral.

Permissible Exposure Limit (PEL): 5 mg/m³

PEL Is For Oil Mist, Mineral.

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, lungs, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 250 mg/m³, a high-efficiency particulate respirator is recommended. Above this level, a self-contained breathing apparatus is advised.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Do not store near oxidizing materials.

Special Precautions: Product may solidify at room temperature.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM BROMATE****0178****PRODUCT INFORMATION**

Product Name: Potassium Bromate
Chinese Name: 溴(V)酸鉀
Common Synonyms: Bromic Acid, Potassium Salt
Chemical Family: Potassium Compounds
Formula: KBrO_3
Formula Wt.: 167.00
CAS No.: 7758-01-2
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 434 deg. C (813 deg. F) Decomposes Vapor Density (Air=1): 5.80
(@ 760 mmHg)
Specific Gravity: 3.27 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Moderate (1-10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals or granules. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Closed containers exposed to heat may explode.

Toxic Gases Produced: Hydrogen bromide
Explosion Data-Sensitivity To Mechanical Impact: Yes.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, shock, dusting
Incompatibles:
Aluminum, organic materials, combustible materials, strong reducing agents, ammonium salts, sulfuric acid, strong acids

Decomposition Products: Hydrogen bromide

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract

Skin Contact: May cause irritation

Eye Contact: May cause irritation

Skin Absorption: None identified

Ingestion: Nausea, vomiting, headache, dizziness, gastrointestinal irritation

Chronic Effects: Kidney Damage, Liver Damage

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Potassium Bromate

321 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Kidneys, liver

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM CHLORATE****0179****PRODUCT INFORMATION**

Product Name: Potassium Chlorate

Chinese Name: 氯(V)酸鉀

Common Synonyms: Chloric Acid, Potassium Salt; Berthollet Salt; Chlorate Of Potash

Chemical Family: Potassium Compounds

Formula: KClO_3

Formula Wt.: 122.55

CAS No.: 3811-04-9

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 356 deg. C (672 deg. F) Vapor Density (Air=1): 4.20
(@ 760 mmHg)
Specific Gravity: 2.32 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Moderate (1-10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use Water Spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move exposed containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. When exposed to heat, closed containers may explode; may also give off highly toxic or irritating fumes.

Toxic Gases Produced: Hydrogen chloride
Explosion Data-Sensitivity To Mechanical Impact: Yes.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, Shock, Friction
Incompatibles: Organic materials, combustible materials, strong reducing agents
Decomposition Products: Hydrogen chloride

HEALTH HAZARD DATA

Inhalation: Irritation of nose and throat
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: Nausea, vomiting, unconsciousness
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Nasal cavities
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Ingestion, inhalation, eye contact, skin contact

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation:
Call a physician. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

Special Precautions: Do not drop or slide drum quantities of product across sharp projections.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM DICHROMATE****0180****PRODUCT INFORMATION**

Product Name: Potassium Dichromate

Chinese Name: 重鉻(VI)酸鉀

Common Synonyms: Dichromic Acid, Dipotassium Salt; Bichromate Of Potash

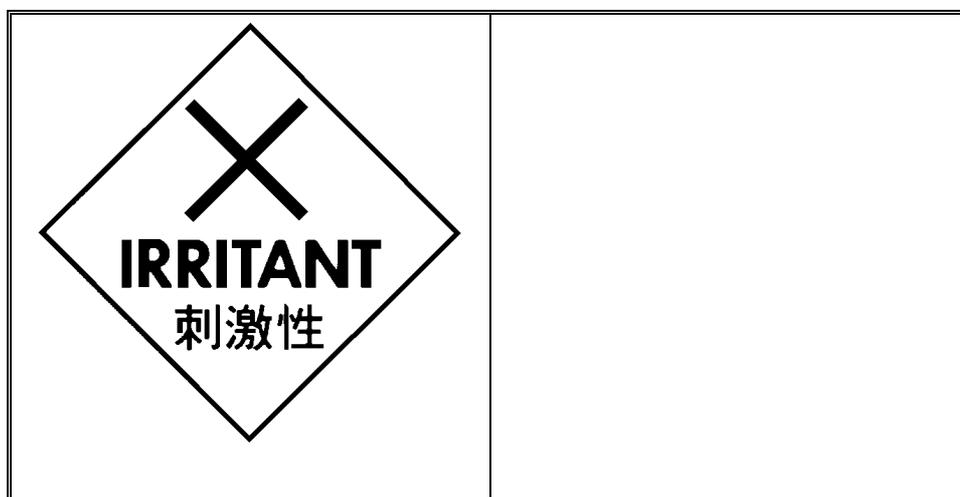
Chemical Family: Chromium Compounds

Formula: $K_2Cr_2O_7$

Formula Wt.: 294.19

CAS No.: 7778-50-9

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: 500 deg. C (932 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 398 deg. C (748 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 2.67 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: 3.6 (10% solution)
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Orange to red crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained Breathing apparatus with full facepiece operated in positive pressure Mode. Move containers from fire area if it can be done without risk. Use Water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Note: decomposes at boiling point.

Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Combustible materials, organic materials, strong reducing agents, strong acids
Decomposition Products: Chromium oxide fumes

HEALTH HAZARD DATA

Inhalation: Severe irritation of respiratory system, prolonged contact may cause perforated septum

Skin Contact: Irritation, prolonged contact may cause dermatitis, and ulceration

Eye Contact: Severe irritation or burns

Skin Absorption: Is harmful and may be fatal

Ingestion: Severe burns, ulceration - mouth, throat, stomach, and may be fatal

Chronic Effects: Damage to liver, kidneys, blood, lungs

Threshold Limit Value (TLV/TWA): 0.05 mg/m³

TLV is for chromium (VI) compounds, water soluble, as Cr.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.1 mg/m³

PEL (ceiling) is for chromic acid and chromates, as CrO₃.

Toxicity Of Components:

Intraperitoneal Mouse LD₅₀ For Potassium Dichromate 37 mg/kg

Carcinogenicity: NTP: Yes IARC: Yes Z LIST: No OSHA REG: No

Carcinogenicity:

This substance is listed as a NTP human carcinogen and an IARC human carcinogen (group 1).

Reproductive Effects: None identified.

Target Organs: Blood, respiratory system, lungs, liver, kidneys, eyes, skin, gi tract

Medical Conditions Generally Aggravated By Exposure: Damaged skin

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact, absorption

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

A respirator with dust/mist filter is recommended. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM FERRICYANIDE****0181****PRODUCT INFORMATION**

Product Name: Potassium Ferricyanide
Chinese Name: 鐵氰化鉀
Common Synonyms: Potassium Hexacyanoferrate (III)
Chemical Family: Iron Compounds
Formula: $K_3Fe(CN)_6$
Formula Wt.: 329.26
CAS No.: 13746-66-2
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: N/A Vapor Density (Air=1): N/A
Specific Gravity: 1.89 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Orange to red crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Cyanides

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Light, heat
Incompatibles: Ammonia, chromic acid, strong acids
Decomposition Products: Cyanides

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: None identified

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Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): 5 mg/m³
TLV (Skin) Is For Cyanides, As CN.
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): 5 mg/m³
PEL Is For Cyanides, As CN.
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Store in light-resistant containers.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM FERROCYANIDE****0182****PRODUCT INFORMATION**

Chemical Name : Potassium Ferrocyanide,
Chinese Name: 亞鐵氰化鉀
Synonyms: Tetra Potassium Hexacyanoferrate (II)
Chemical Family: Inorganic Salt
Chemical Formula: $K_4Fe(CN)_6 \cdot 3H_2O$
CAS No. : 13943-58-3
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

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The above information is believed to be accurate to the best of our knowledge.
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Odour and Appearance: Lemon yellow crystals or powder; odourless
Odour Threshold (ppm): Not applicable
Vapour Pressure (mmHg): Not applicable
Vapour Density (Air=1): Not applicable
Evaporation Rate: Not applicable
Boiling Point : Decomposes
Melting Point : Not available
pH: Not Available
Specific Gravity: 1.850
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Nonflammable
Extinguishing Media: Use an extinguisher appropriate to the surrounding material that is burning.
Flash Point (Method Used): Not applicable
Autoignition Temperature: Not applicable
Upper Flammable Limit (% by volume): Not applicable
Lower Flammable Limit (% by volume): Not applicable
Hazardous Combustion Products: Toxic fumes of cyanides

REACTIVITY DATA

Chemical Stability: Normally stable
Incompatibility with other substances: NH_3 , CrO_3 , NaNO_2 , acids and acid fumes
Reactivity: Cyanides plus heat
Hazardous Decomposition Products:
Highly toxic fumes of cyanides, oxides of carbon, nitrogen and potassium.

HEALTH HAZARD DATA

Inhaled: Sore throat, coughing
In contact with skin: Causes irritation
In contact with eyes: Causes irritation
Ingested:
Moderately toxic via oral route. This material is not as powerful a poison as the simple cyanides.

LD₅₀: Not available
LC₅₀: Not available
Carcinogenicity: Not a carcinogen.

Teratogenicity: No information available
Reproductive Effects: No information available
Mutagenicity: No information available
Synergistic Products: None known

FIRST AID MEASURES

Eyes:

Wash eyes with plenty of water for at least fifteen (15) minutes, holding eyelids open. Seek medical attention.

Skin:

Remove any contaminated clothing. Wipe off excess from skin. Wash skin with soap and water for at least fifteen (15) minutes. Unless contact has been Slight, seek medical attention if irritation persists.

Inhalation:

Remove patient to fresh air. Give artificial respiration if not breathing. Seek immediate medical attention.

Ingestion:

Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Rinse mouth thoroughly with water. Do not induce vomiting. Have victim drink 200-400 ml of water to dilute. Seek medical attention immediately.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation recommended

Respiratory Protection:

Dust mask. Self-contained breathing apparatus. An approved respirator may be adequate-refer to CSA Standard Z94.4-M1982 Selection Care, and use respirators.

Eye Protection:

Chemical safety goggles or face shield as appropriate. Skin Protection: Gloves, rubber or plastic

Other Personal Protective Equipment: Plastic apron, sleeves and boots as appropriate.

Handling Procedures and Equipment: Avoid generating dust. Follow routine safe handling procedures.

Storage Requirements:

Store in suitable labelled containers, in a cool, dry well ventilated area. Keep containers tightly closed when not in use and when empty. Protect from damage, and also from light.

ENVIRONMENTAL PROTECTION DATA

Leak And Spill Procedure:

Before dealing with spillages take necessary protective measures. Shovel carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM NITRATE****0184****PRODUCT INFORMATION**

Product Name: Potassium Nitrate
Chinese Name: 硝(V)酸鉀
Common Synonyms: Saltpeter; Nitric Acid, Potassium Salt
Chemical Family: Potassium Compounds
Formula: KNO_3
Formula Wt.: 101.11
CAS No.: 7757-79-1
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 334 deg. C (633 deg. F) Vapor Density (Air=1): 3.00
(@ 760 mmHg)
Specific Gravity: 2.11 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystalline powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Closed containers exposed to heat may explode.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Organic materials, combustible materials, strong reducing agents
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract, irritation of mucous membranes.

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Nausea, vomiting, diarrhea

Chronic Effects: Bladder, central nervous system depression

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rabbit LD₅₀ For Potassium Nitrate

1901 mg/kg

Oral Rat LD₅₀ For Potassium Nitrate

3750 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Blood, central nervous system

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Keep combustibles (wood, paper, oil, etc.) Away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM NITRATE, CRYSTAL****0185****PRODUCT INFORMATION**

Product Name: Sodium Nitrate, Crystal

Chinese Name: 硝(V)酸鈉

Common Synonyms: Sodium (I) Nitrate; Nitric Acid, Sodium Salt; Soda Niter; Chile Saltpeter

Chemical Family: Inorganic Sodium Compounds

Formula: NaNO_3

Formula Wt.: 84.99

CAS No.: 7631-99-4

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 306 deg. C (582 deg. F) Vapor Density (Air=1): 2.90
(@ 760 mmHg)
Specific Gravity: 2.26 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless crystals or powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Can react violently with shock, friction or heat.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Shock, friction, heat
Incompatibles: Cyanides, combustible materials, organic materials, strong reducing agents, aluminum
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation:

Irritation of upper respiratory tract, cyanosis, unconsciousness, headache, nausea, vomiting, dizziness, weakness, rapid ineffective breathing, low blood pressure, convulsions

Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion:

Gastrointestinal irritation, cyanosis, unconsciousness, headache, nausea, vomiting, dizziness, weakness, rapid ineffective breathing, low blood pressure, convulsions

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Keep combustibles (wood, paper, oil, etc.) Away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS SODIUM THIOSULFATE, 5-HYDRATE 0186**PRODUCT INFORMATION**

Product Name: Sodium Thiosulfate, 5-Hydrate

Chinese Name: 硫代硫酸鈉

Common Synonyms: Sodium Thiosulfate, Pentahydrate; Sodium Hyposulfite, 5-Hydrate

Chemical Family: Inorganic Sodium Compounds

Formula: $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$

Formula Wt.: 248.18

CAS No.: 10102-17-7

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 48 deg. C (118 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 1.69 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals or powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Sulfur dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Iodine, strong acids, mercury, strong oxidizing agents, sodium, potassium
Decomposition Products: Oxides of sulfur

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Prolonged contact may cause irritation
Eye Contact: Irritation

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Skin Absorption: None identified
Ingestion: Gastrointestinal irritation
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Intraperitoneal Mouse LD₅₀ For Sodium Thiosulfate, 5-Hydrate
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

5600 mg/kg

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Then induce vomiting.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

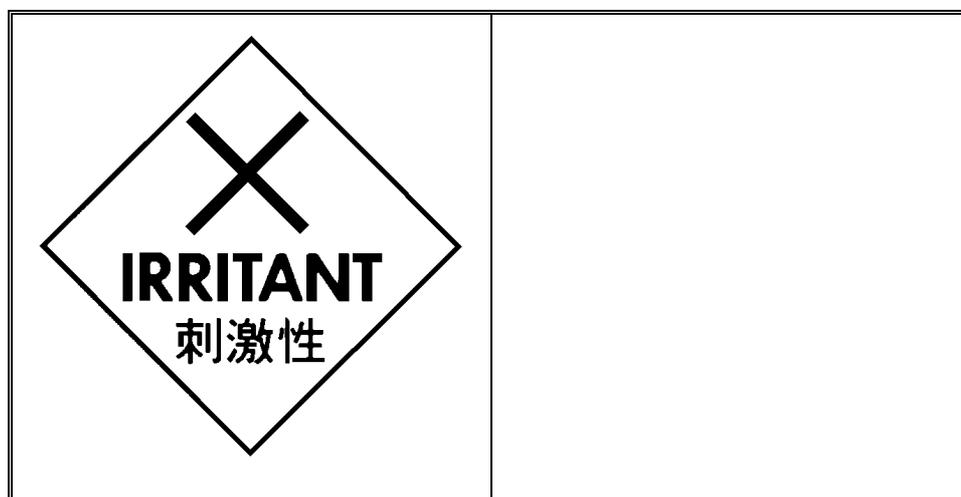
Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CERIC SULFATE****0187****PRODUCT INFORMATION**

Product Name: Ceric Sulfate
Chinese Name: 硫(VI)酸鈾(IV)
Common Synonyms: Tetrasulfatoceric Acid; Cerium Disulfate
Chemical Family: Cerium Compounds
Formula: $Ce(SO_4)_2$
Formula Wt.: 528.40
CAS No.: 13590-82-4
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 350 deg. C (662 deg. F) Decomposes Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 3.91 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Decomposes % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Yellow-Orange crystalline powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use Water Spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Note: decomposes at melting point.

Toxic Gases Produced: Sulfur dioxide
Explosion Data-Sensitivity To Mechanical Impact: Yes.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, shock
Incompatibles: Strong reducing agents, combustible materials, organic materials
Decomposition Products: Oxides of sulfur

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No
Carcinogenicity: None identified.
Reproductive Effects: None identified.
Effects Of Overexposure:
Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified

Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**AGAR AGAR****0188****PRODUCT INFORMATION**

Product Name: Agar Agar
Chinese Name: 瓊脂, 瓊膠, 洋菜膠
Common Synonyms: Polysaccharide Complex
Chemical Family: Natural Products
Formula: N/A
Formula Wt.: N/A
CAS No.: 9002-18-0
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White to light yellow crystalline powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles: Strong oxidizing agents
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Agar Agar 11 g/kg
Oral Mouse LD₅₀ For Agar Agar 16 g/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None Indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS

Aluminum Granules

0189

PRODUCT INFORMATION

Material Name: Aluminum Granules

Chinese Name: 鋁

CAS NO.: 7429-90-5

RISK SYMBOL

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PHYSICAL DATA

Appearance & Odor: Silvery - gray

Boiling point (Approx.): 2630°C

Evaporation rate: N.A.

Vapor pressure: 1 mm at 20°C

Specific gravity (H₂O=1): 2.7

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Water solubility %: Insoluble
Melting point: 660°C
Vapor density (air=1): N.A.
% Volatile by volume: N.A.
Molecular weight: 26.98

FIRE AND EXPLOSION DATA

Flash point & method: N.A.
Lower explosion limit: 590°C
Upper explosion limit: 45 mg/L
Extinguishing media:
Dry sand, dry inert granular material or powder, or dry powder extinguishing agent.

REACTIVITY DATA

Material is stable. Hazardous polymerization will not occur.

CHEMICAL INCOMPATIBILITIES:

Acids, strong Alkalies, strong bases, Silver Chloride, Iodates, Chlorinated Hydrocarbons, Oxides, Nitrates, Nitrites, Carbon Disulfide, Chlorides, Sodium Peroxide plus CO₂, Sulfur Dichloride, Palladium, Manganese, Magnesium plus Potassium Chlorate, Sodium Carbonate, Sulfates, Diborane.

HAZARDOUS DECOMPOSITION PRODUCTS:

Corrodes rapidly in contact with many other metals. Reacts with water, acids, and caustic alkalies evolving flammable hydrogen gas. May form explosive mixtures with oxidizing agents.

CONDITIONS TO AVOID:

Improper storage which would allow introduction of water and, or foreign matter.

HEALTH HAZARD DATA

This product is not considered a carcinogen.

TARGET ORGANS: Eyes, skin, lungs, mucous membranes, central nervous system, gastrointestinal.

PRIMARY ENTRY ROUTE(S): Inhalation, skin or eye contact, ingestion.

ACUTE EFFECTS:

Aluminum powder is an eye and mucous membrane irritant. Chronic inhalation may affect the respiratory system and result in aluminum pneumoconiosis and pulmonary fibrosis. Membrane and upper respiratory tract irritation may result from liberation of acid by hydrolysis.

Excessive level of aluminum in the brain has been associated with senility and Alzheimer's disease.

FIRST AID MEASURES

EYE CONTACT:

Immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

SKIN CONTACT:

Immediately flush contaminated skin with water. Get medical attention promptly.

INHALATION:

Move the person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If this chemical is ingested, do not induce vomiting. Seek

PREVENTATIVE MEASURES

PERSONAL PROTECTIVE EQUIPMENT: Flame resistant coverall.

GOGGLES: Safety goggles with side shields.

GLOVES: Required

RESPIRATOR: Dust mask, use in well-ventilated areas.

WORKPLACE CONSIDERATIONS:

Sufficient ventilation, in volume and pattern, should be provided to keep air contamination below current applicable OSHA permissible exposure limits.

SPECIAL HANDLING:

Keep away from water. Store in cool, dry area. Keep sources of ignition away. Handle only with non-sparking, non-static implements.

ENVIRONMENTAL PROTECTION DATA

SPILL/LEAK PROCEDURES:

Sweep spill gently to avoid dust cloud formation. Use only non-sparking, non-static generating implements. **DO NOT USE WATER.** Have sand pails available. Keep spill from contaminating water sources and sewers.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ZINC SULFATE, 7-HYDRATE****0190****PRODUCT INFORMATION**

Product Name: Zinc Sulfate, 7-Hydrate

Chinese Name: 硫(VI)酸鋅

Common Synonyms: N/A

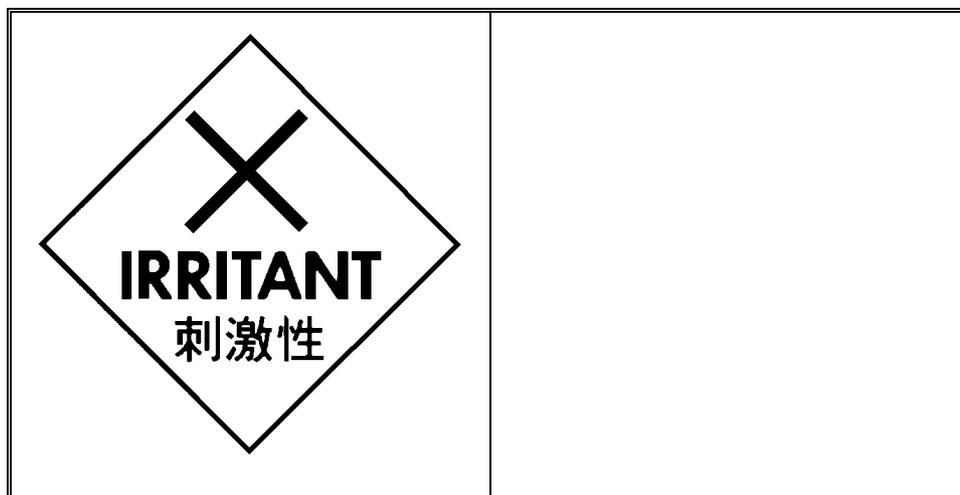
Chemical Family: Zinc Compounds

Formula: $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$

Formula Wt.: 287.56

CAS No.: 7446-20-0

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 100 deg. C (212 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 1.97 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless crystalline powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Sulfur dioxide, zinc fumes

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, moisture
Incompatibles: Water
Decomposition Products: Oxides of sulfur, oxides of zinc

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established

Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: Gastrointestinal pain
Chronic Effects: None identified
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact: In case of contact, flush skin with water.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.
Respiratory Protection:
None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.
Eye/Skin Protection: Safety goggles, rubber gloves are recommended.
Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS ALUMINUM AMMONIUM SULFATE, 0191
12-HYDRATE

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PRODUCT INFORMATION

Product Name: Aluminum Ammonium Sulfate, 12-Hydrate

Chinese Name: 硫(VI)酸鋁鉍

Common Synonyms: Ammonium Alum

Chemical Family: Aluminum Compounds

Formula: $\text{AlNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$

Formula Wt.: 453.33

CAS No.: 7784-26-1

Product Use: Laboratory Reagent

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RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Boiling Point: N/A

Melting Point: 94 deg. C (201 deg. F)
(@ 760 mmHg)

Specific Gravity: 1.65
(H₂O=1)

Solubility(H₂O): Appreciable (>10%)

Vapor Pressure (mmHg): N/A

Vapor Density (Air=1): N/A

Evaporation Rate: N/A

% Volatiles By Volume: 0
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: White crystals.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.

Toxic Gases Produced: Ammonia, sulfur dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: None documented

Incompatibles: None identified

Decomposition Products: Ammonia, oxides of sulfur

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Aluminum Ammonium Sulfate

2750 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation: None identified

Skin Contact: None identified

Eye Contact: None identified

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS FERROUS AMMONIUM SULFATE, 0192
6-HYDRATE

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PRODUCT INFORMATION

Product Name: Ferrous Ammonium Sulfate, 6-Hydrate
Chinese Name: 硫(VI)酸鐵(II)鉍
Common Synonyms: Ammonium Iron (II) Sulfate, Hexahydrate
Chemical Family: Iron Compounds
Formula: $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$
Formula Wt.: 392.14
CAS No.: 7783-85-9
Product Use: Laboratory Reagent

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RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Boiling Point: N/A

Melting Point: N/A

Specific Gravity: 1.86
(H₂O=1)

Solubility(H₂O): Slight (0.1-1%)

Vapor Pressure (mmHg): N/A

Vapor Density (Air=1): >1.0

Evaporation Rate: N/A

% Volatiles By Volume: 0
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: Light blue-green solid. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Use water to keep fire-exposed containers cool. Move exposed containers from fire area, if it can be done without risk.

Unusual Fire & Explosion Hazards: Closed containers exposed to heat may explode.

Toxic Gases Produced: Ammonia, oxides of nitrogen, sulfur dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Light

Incompatibles: Sulfuric acid

Decomposition Products: Oxides of sulfur, oxides of nitrogen, ammonia

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Ferrous Ammonium Sulfate 3250 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Store in light-resistant containers.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): 1 mg/m³
TLV Is For Iron Salts, Soluble, As Fe.
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): 1 mg/m³
PEL Is For Iron Salts, Soluble, As Fe.
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Eyes, skin
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:
In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS ANTIMONY PENTACHLORIDE 0194**PRODUCT INFORMATION**

Product Name: Antimony Pentachloride
Chinese Name: 氯化銻(V)
Common Synonyms: Antimony (V) Chloride; Antimony Perchloride
Chemical Family: Antimony Compounds
Formula: SbCl_5
Formula Wt.: 299.02
CAS No.: 7647-18-9
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Threshold Limit Value (TLV/TWA): 0.5 mg/m³

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.5 mg/m³

Toxicity Of Components:

Oral Rat LD₅₀ For Antimony Pentachloride

1115 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, cardiovascular system, eyes, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep vapor and mist levels as low as possible.

Respiratory Protection:

A chemical cartridge respirator with organic vapor cartridge is recommended. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection:

Safety goggles and face shield, uniform, protective suit, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in corrosion-proof area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Use water spray to reduce vapors. take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BROMOCRESOL GREEN****0195**

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PRODUCT INFORMATION

Product Name: Bromocresol Green

Chinese Name: 溴甲酚綠

Common Synonyms: 3',3'',5',5''-Tetrabromo-m-Cresolsulfonphthalein

Chemical Family: Dyes, Stains, And Indicators

Formula: $C_{21}H_{14}Br_4O_5S$

Formula Wt.: 698.02

CAS No.: 76-60-8

Product Use: Laboratory Reagent

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RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 217 deg. C (422 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: N/A Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Slight (0.1-1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Yellow to tan crystals.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Sulfur dioxide, hydrogen bromide, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: None identified
Decomposition Products: Hydrogen bromide, oxides of sulfur, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified

Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Eye/Skin Protection:

This is a laboratory-use product for which no industrial protective equipment has been designated.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**BROMOTHYMOL BLUE****0196**

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PRODUCT INFORMATION

Product Name: Bromothymol Blue
Chinese Name: 溴百里<香>酚藍
Common Synonyms: 3',3''-Dibromothymolsulfonphthalein
Chemical Family: Dyes, Stains, And Indicators
Formula: $C_{27}H_{28}Br_2O_5S$
Formula Wt.: 624.39
CAS No.: 76-59-5
Product Use: Laboratory Reagent

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RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

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Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 200 deg. C (392 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: N/A Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Pink to purple powder.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Sulfur dioxide, hydrogen bromide, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: Strong oxidizing agents
Decomposition Products: Oxides of sulfur, hydrogen bromide, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: None identified

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Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Eye/Skin Protection:

This is a laboratory-use product for which no industrial protective equipment has been designated.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS CALCIUM CARBONATE (Limestone) 0197

PRODUCT INFORMATION

Chemical Name: Calcium Carbonate (Limestone)

Chinese Name: 碳酸鈣

CAS #: 1317-65-3

Chemical Formula: CaCO₃

Product Uses: Mineral filler and pigment

RISK SYMBOL

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PHYSICAL DATA

Density: 2.7 g/ml

Solubility in Water: 1.3 mg/100 g @ 18 deg. C

Appearance and Odor: White powder, no odor

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Flash Point: Non-Flammable
Unusual Fire and Explosion Hazards: None
Special Firefighting Procedures: None

REACTIVITY DATA

Stability: Stable
Reactivity in Water: None
Hazardous Decomposition Products: None
Hazardous Polymerization: Will not occur
Incompatibility (Materials to Avoid): Reacts with strong acid to liberate carbon dioxide.

HEALTH HAZARD DATA

Effects And Hazards Of Acute Exposure:

Inhalation:

Can be irritating to the respiratory tract. Symptoms include sneezing and slight nose irritation.

Eye Contact: Mild irritation. Symptoms include watering and irritation.

Skin Contact: Can be irritating to the skin. Symptoms include redness and irritation.

Ingestion:

Ingestion of very large quantities may result in intestinal obstruction and/or constipation. Considered to be of very low toxicity.

Effects And Hazards Of Chronic Exposure:

There are no reported health effects associated with repeated or prolonged Exposure to pure calcium carbonate.

If this is crystalline silica (quartz) present in the calcium carbonate, Exposure to airborne concentrations may increase the risk of developing a Disabling lung disease called silicosis.

This product contains crystalline silica as a minor impurity; it is present At the 0.5% to 3.5% level, depending on the product and the lot. Crystalline Silica has been reviewed by IARC and they have found limited evidence for Pulmonary carcinogenicity in humans.

This product itself, calcium carbonate, is not listed as a carcinogen by OSHA, NTP, or IARC.

The above information is believed to be accurate to the best of our knowledge.
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FIRST AID MEASURES

Inhalation:

Remove source of contamination or move victim to fresh air. Obtain medical Advice if required.

Eye Contact:

Immediately flush the contaminated eye(s) with lukewarm, gently flowing Water, for 10 minutes, by the clock, holding the eyelid(s) open. If Irritation persists, obtain medical advice immediately.

Skin Contact:

If irritation occurs, flush area with lukewarm, gently running water for at least 10 minutes. If irritation persists, obtain medical advice immediately.

Ingestion:

Never give anything by mouth if victim is rapidly losing consciousness or is Unconscious or convulsing. Rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 8 to 10 oz. (240 to 300 ml) of water to dilute Material in stomach. Obtain medical advice immediately.

PREVENTATIVE MEASURES

Handling:

When there is large-scale use of this material, engineering control methods To reduce exposures may be necessary. Use local exhaust ventilation and Process enclosure to control airborne dust. A dust collecting system attached To the ventilation system may also be necessary. Supply sufficient Replacement air to make up for air removed by exhaust systems. If engineering controls and work practices are not effective in controlling exposure to this material, then wear suitable personal protective equipment including NIOSH or OSHA approved dust respirators.

Storage Conditions: Store in closed containers in a dry place separate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Spill And Leak Procedures:

Respiratory protection should be worn by those in cleanup operations to Protect from airborne dust. Measures should be taken to reduce airborne dust during cleanup operations.

Material Safety Data Sheet

City University of Hong Kong

MSDS

CALCIUM CHLORIDE

0198

PRODUCT INFORMATION

Chemical Name: Calcium Chloride

Chinese Name: 氯化鈣

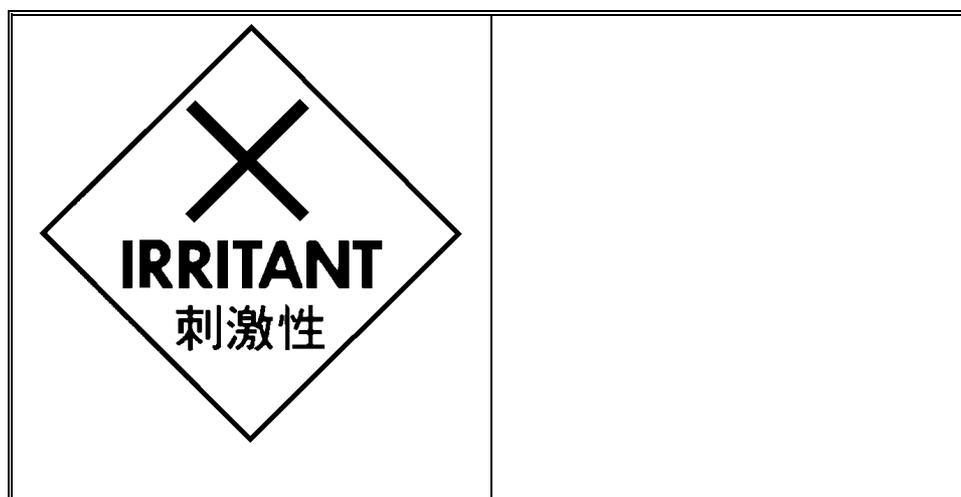
Synonym(S): High Test Fines, High Test Powder, 77%

Chemical Family: Inorganic Salt

Molecular Formula: CaCl₂

Product Use: Industrial uses, drilling mud additive, workover fluids, completion fluids.

RISK SYMBOL



PHYSICAL DATA

Physical State: Solid.

Odour And Appearance: Odourless white to off white grains.

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The above information is believed to be accurate to the best of our knowledge.
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Odour Threshold: Not applicable.
Vapour Pressure: 0.005 mmHg, at 20 deg. C.
Vapour Density: Not applicable.
pH: Of aqueous solution >7.
Solubility In Water: Very soluble.
Specific Gravity: 2.2

Evaporation Rate: Not applicable.
Boiling Point: 815 deg. C.
% Volatile By Volume: ~ 0

FIRE AND EXPLOSION DATA

Conditions Of Flammability: Not applicable.
Means Of Extinguishing: Use water, dry chemical or carbon dioxide
Flash Point: Not applicable.
Upper Flammable Limit: Not applicable.
Lower Flammable Limit: Not applicable.
Special Fire Fighting Procedures:
Wear self-contained breathing apparatus when fighting large fires. Combustion produces toxic fumes.

Explosion Hazards: Explosion when mixed with Furan 2 - Peroxy - Carboxylic Acid.

REACTIVITY DATA

Stability: Very stable.
Hazardous Polymerization: Will not occur
Incompatibility: None.
Hazardous Decomposition Products: Combustion produces toxic fumes.
Conditions To Avoid: Heat, open flames, metal will corrode in aqueous solutions of calcium chloride.

HEALTH HAZARD DATA

Inhalation: Dust may cause irritation to upper respiratory tract.
Skin Contact: Prolonged exposure may cause skin irritation or burns.
Eye Contact: May cause severe irritation with corneal injury, which may be slow to heal.
Ingestion: Large ingestions may cause gastro-intestinal irritation or ulcerations.
Chronic Exposure Effects: Overexposure to calcium chloride can led to stomach disturbances.
Exposure Limits: Nuisance particulate level of 10 mg/m³.
Irritancy: Slight.
Mutagenicity: Not available
Carcinogenicity: Not regulated.
Sensitization To Product: Not available.

Reproductive Toxicity: Not available.

Animal Toxicity Data:

LD₅₀ - 1090 1668 mg/kg oral, rat.

- 123 mg Sr/kg intravenous, rat

FIRST AID MEASURES

Inhalation:

Remove to fresh air. Give artificial respiration if necessary. Seek medical attention if irritation persists.

Eye And Skin Contact:

Immediately flush eyes and/or skin with water. Remove contaminated clothing. Seek medical attention if irritation persists.

Ingestion:

Give large quantities of milk or water. Never give anything by mouth to an unconscious person. Seek medical attention if irritation persists.

PREVENTATIVE MEASURES

Respiratory Protection: Dusty atmospheres require approved NIOSH dust respirator.

Eye And Face Protection:

Safety goggles or chemical goggles in very dusty atmospheres. Eye wash fountain should be located in immediate work area. In these conditions do not wear contact lenses.

Protective Clothing: Impervious clothing suitable to task, normal work clothing usually sufficient

Storage Requirements:

Store in a dry location. Prolonged storage may cause product to cake and become wet from atmospheric moisture.

Engineering Controls: General and/or local exhaust to control airborne dust.

ENVIRONMENTAL PROTECTION DATA

Procedures To Be Followed In Case Of A Leak Or Spill:

Shovel and sweep up spill and place in a container with a cover. Flush Residue with large amounts of water. Keep contaminated water from entering Sewers and water courses.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS CALCIUM ACETATE, POWDER 0199**PRODUCT INFORMATION**

Product Name: Calcium Acetate, Powder

Chinese Name: 醋酸鈣

Common Synonyms: N/A

Chemical Family: Calcium Compounds

Formula: $(\text{CH}_3\text{COO})_2\text{Ca}$

Formula Wt.: 158.17

CAS No.: 5743-26-0

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: N/A Vapor Density (Air=1): N/A
Specific Gravity: 1.50 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame
Incompatibles: Strong oxidizing agents
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of mucous membranes
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: Ingestion of large quantities may cause gastrointestinal irritation

The above information is believed to be accurate to the best of our knowledge.
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Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Calcium Acetate

4280 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS CALCIUM SULFATE, DIHYDRATE, 0200
POWDER

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PRODUCT INFORMATION

Product Name: Calcium Sulfate, Dihydrate, Powder

Chinese Name: 硫(VI)酸鈣

Common Synonyms: Gypsum; Alabaster; C.I. 77231; C.I. Pigment White 25

Chemical Family: Calcium Compounds

Formula: $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Formula Wt.: 172.17

CAS No.: 10101-41-4

Product Use: Laboratory Reagent

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RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Boiling Point: N/A

Vapor Pressure (mmHg): N/A

Melting Point: 1450 deg. C (2642 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)

Specific Gravity: 2.32
(H₂O=1)

Evaporation Rate: N/A

Solubility(H₂O): Slight (0.1-1%)

% Volatiles By Volume: 0
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: White powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.

Toxic Gases Produced: Sulfur dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Heat, dusting

Incompatibles: Aluminum, strong acids

Decomposition Products: Oxides of sulfur

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: None identified
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): 10 mg/m³
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): 15 mg/m³
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, eye contact

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS ACTIVATED CHARCOAL, POWDER 0201

PRODUCT INFORMATION

Product Name: Activated Charcoal, Powder
Chinese Name: 活性炭
Common Synonyms: Activated Carbon; Carboraffin; Carborafine
Chemical Family: Carbon
Formula: C
Formula Wt.: 12.01
CAS No.: 7440-44-0
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 3500 deg. C (6332 deg. F) Vapor Density (Air=1): 0.4
(@ 760 mmHg)
Specific Gravity: 2.30 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Black powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray, carbon dioxide, dry chemical or ordinary foam.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained Breathing apparatus with full facepiece operated in positive pressure Mode. Move containers from fire area if it can be done without risk. Use Water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards: Contact with strong oxidizers may cause fire or explosion.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition
Incompatibles: Strong oxidizing agents
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation:
Irritation of upper respiratory tract, excessive inhalation is irritating, may cause respiratory system damage

Skin Contact: None identified
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Intravenous Mouse LD₅₀ For Activated Carbon 440 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in cool, dry, well-ventilated area away from heat, sparks, or flame.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Shut off ignition sources; no flares, smoking, or flames in area. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CHROMIUM OXIDE****0203****PRODUCT INFORMATION**

Product Name: Chromium Oxide

Chinese Name: 氧化鉻(III)

Common Synonyms: Chromium (III) Oxide; Chromic Oxide; Chrome Oxide Green

Chemical Family: Chromium Compounds

Formula: Cr_2O_3

Formula Wt.: 151.99

CAS No.: 1308-38-9

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: 4000 deg. C (7232 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 2435 deg. C (4415 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 5.10 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Light to dark green crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Dusting
Incompatibles: Lithium, glycerol
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation

Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: May be harmful, gastrointestinal irritation
Chronic Effects: Blood, and liver damage
Threshold Limit Value (TLV/TWA): 0.5 mg/m³
TLV Is For Chromium (III) Compounds, As Cr.
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): 0.5 mg/m³
PEL Is For Chromium (III) Compounds, As Cr.
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity:

Studies indicate chromium (III) oxide is not carcinogenic. The national toxicity program (NTP) lists "chromium and certain chromium compounds" as substances known to be carcinogens. Note: specific chromium compounds and levels cannot be identified. This product may contain low levels of hexavalent chromium which is carcinogenic.

Reproductive Effects: None identified.

Target Organs: Respiratory system, lungs

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 1 ppm, a dust/mist respirator is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

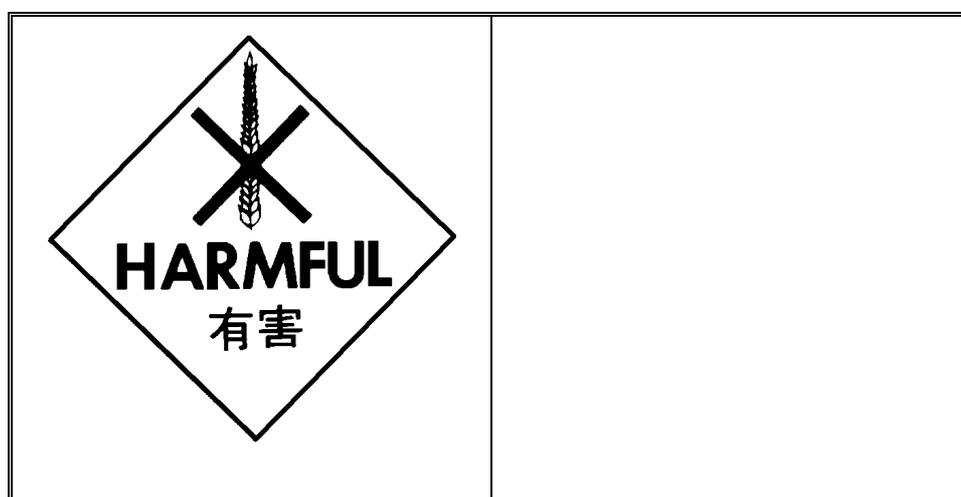
Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS COBALT NITRATE, 6-HYDRATE 0204**PRODUCT INFORMATION**

Product Name: Cobalt Nitrate, 6-Hydrate
Chinese Name: 硝(V)酸鈷(II)
Common Synonyms: Cobalt (II) Nitrate, Hexahydrate; Cobalt Dinitrate, Hexahydrate
Chemical Family: Cobalt Compounds
Formula: $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$
Formula Wt.: 291.03
CAS No.: 10026-22-9
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: 55 deg. C (131 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 56 deg. C (132 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 1.54 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Complete (100%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Red crystals. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None identified
Incompatibles: Combustible materials, strong reducing agents
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation: Irritation of nose and throat, headache, coughing, dizziness, difficult breathing
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: Nausea, vomiting
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Oral Rat LD₅₀ For Cobalt Nitrate, 6-Hydrate 691 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact: In case of contact, flush skin with water.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS

COPPER METAL

0205

PRODUCT INFORMATION

Chemical Name And Synonyms: Copper Metal

Chinese Name: 銅

Chemical Family: Metal

Chemical Formula: Cu

CAS No.: 7440-50-8

Product Use: Laboratory Use, Industrial Processes

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Odour and Appearance: A bright reddish metal in the form of foil, wire or turnings.

City University of Hong Kong

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Odour Threshold (ppm): Not applicable
Vapour Pressure (mm Hg): 1 mm Hg at 1628 deg. C
Vapour Density (Air=1): Not applicable
Evaporation Rate: Not applicable
Boiling Point : 2324 deg. C
Melting Point : Not available
pH: Not available
Specific Gravity: 8.920
Coefficient of Water/Oil distribution: Not applicable

FIRE AND EXPLOSION DATA

Flammability: Nonflammable
Extinguishing Media: Use any means suitable for surrounding fire
Flash Point (Method Used): None
Autoignition Temperature: Not available
Upper Flammable Limit (% by volume): Not applicable
Lower Flammable Limit (% by volume): Not applicable
Hazardous Combustion Products: None
Sensitivity to Impact: None
Sensitivity to Static discharge: None

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances:
Oxidizers, acetylene, 1-bromo-2 propyne, acid chlorides, halogens, acids

Reactivity: May discolour on exposure to air and moisture.
Hazardous Decomposition Products: None known

HEALTH HAZARD DATA

LD₅₀: TLlo (oral, rat) 1.2 mg/kg
LC₅₀: Not Available

Inhaled: Not applicable
In contact with skin: No known harmful effects.
In contact with eyes: Mechanical irritant
Ingested: No information available

Carcinogenicity: No information available
Teratogenicity: No information available
Reproductive Effects: No information available
Mutagenicity: No information available
Synergistic Products: None known

FIRST AID MEASURES

Eyes: Wash thoroughly with water. Get medical advice if irritation develops.

Skin:

Remove contaminated clothing. Wash skin with plenty of water for at least fifteen (15) minutes. If irritation develops seek medical attention.

Inhalation: Not applicable

Ingestion:

Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Rinse mouth thoroughly with water. Do not induce vomiting. Have victim drink 220-400 ml of water to dilute. Seek medical attention.

PREVENTATIVE MEASURES

Engineering Controls:

The hazard potential of this material is relatively low. General ventilation is usually sufficient.

Respiratory Protection: Not usually required

Eye Protection: Chemical safety goggles Skin Protection: Rubber gloves

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures and Equipment: Follow routine safe handling procedures

Storage Requirements:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Store under nitrogen. Protect from damage.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure: Sweep or gather up and transfer to a container for recovery or disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CUPROUS OXIDE****0206****PRODUCT INFORMATION**

Product Name: Cuprous Oxide

Chinese Name: 氧化銅(I)

Common Synonyms: Red Copper Oxide; Brown Copper Oxide

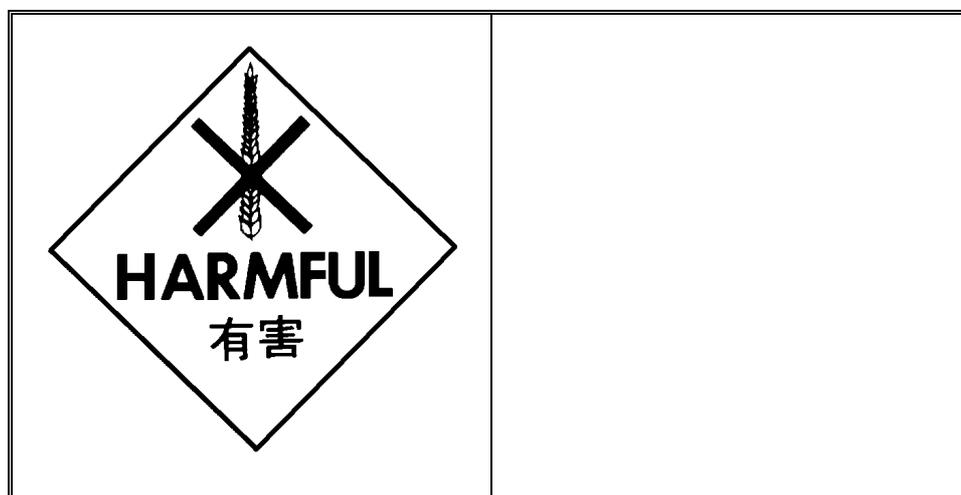
Chemical Family: Copper Compounds

Formula: Cu_2O

Formula Wt.: 143.09

CAS No.: 1317-39-1

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: 1800 deg. C (3272 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 1232 deg. C (2249 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 6.00 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Red to brown powder.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Oxides

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Air, moisture, heat
Incompatibles: None identified
Decomposition Products: Oxides

HEALTH HAZARD DATA

Inhalation: Excessive inhalation is irritating, may cause respiratory system damage

Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: May be harmful
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Oral Rat LD₅₀ For Cuprous Oxide 470 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Skin contact: in case of contact, flush skin with water.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.
Respiratory Protection:
Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 1 ppm, a high-efficiency particulate respirator is recommended. Above this level, a self-contained breathing apparatus is advised.
Eye/Skin Protection:
Safety goggles, proper gloves are recommended. storage requirements: keep containers out of sun and away from heat.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CUPRIC CARBONATE****0207****PRODUCT INFORMATION**

Product Name: Cupric Carbonate

Chinese Name: 碳酸銅(II)

Common Synonyms: Copper (II) Carbonate; Cupric Carbonate, Basic; Copper Carbonate Hydroxide

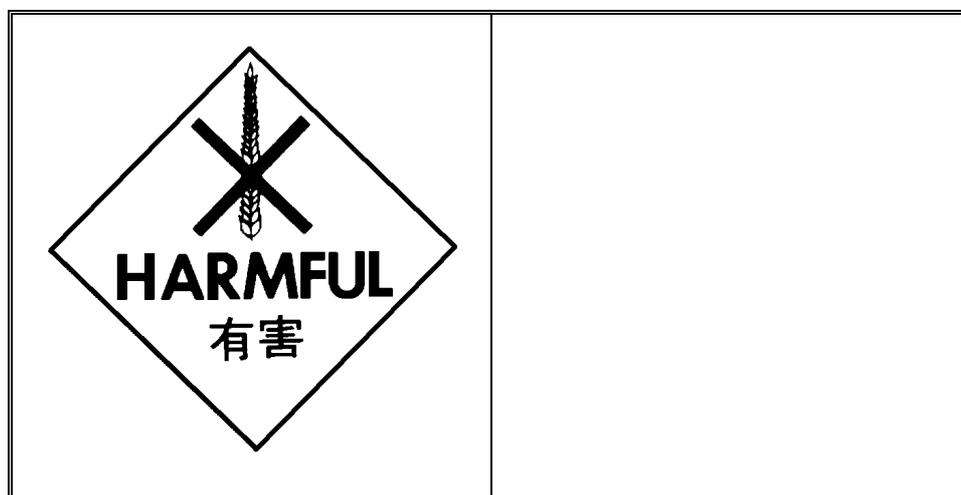
Chemical Family: Copper Compounds

Formula: Mixture $\text{Cu}(\text{CO}_3)$ & $\text{Cu}(\text{OH})_2$

Formula Wt.: N/A

CAS No.: 12069-69-1

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: 3.90
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Blue-green powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures: None identified.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: Strong acids
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: Nausea, vomiting, gastrointestinal pain
Chronic Effects: Kidney damage, liver damage
Threshold Limit Value (TLV/TWA): 1 mg/m³
Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 6 ppm, a high-efficiency particulate respirator is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS CUPRIC CHLORIDE, DIHYDRATE 0208**PRODUCT INFORMATION**

Product Name: Cupric Chloride, Dihydrate
Chinese Name: 氯化銅(II)
Common Synonyms: Copper (II) Chloride, Dihydrate
Chemical Family: Copper Compounds
Formula: $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$
Formula Wt.: 170.48
CAS No.: 10125-13-0
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: 100 deg. C (212 deg. F)
(@ 760 mmHg)
Specific Gravity: 2.51
(H₂O=1)
Solubility(H₂O): Complete (100%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Blue-green crystals or powder.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Hydrogen chloride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles: Potassium, sodium, water
Decomposition Products: Hydrogen chloride

HEALTH HAZARD DATA

Inhalation: Irritation of nose and throat, headache, coughing, dizziness, difficult breathing
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified

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Ingestion: Nausea, vomiting
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): 1 mg/m³
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact: In case of contact, flush skin with water.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.
Respiratory Protection:
Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 9 ppm, a high-efficiency particulate respirator is recommended. Above this level, a self-contained breathing apparatus is advised.
Eye/Skin Protection: Safety goggles, uniform, rubber gloves are recommended
Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

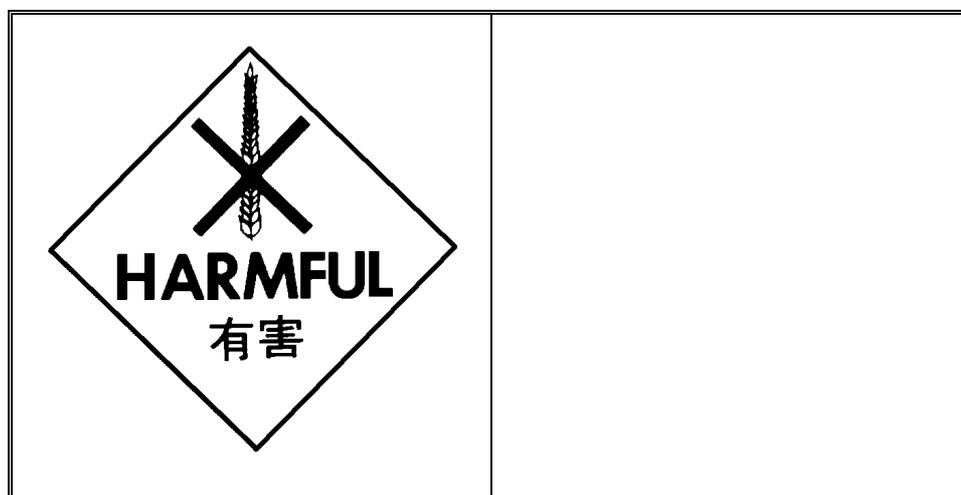
The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**CUPRIC OXIDE****0209****PRODUCT INFORMATION**

Product Name: Cupric Oxide
Chinese Name: 氧化銅(II)
Common Synonyms: Copper (II) Oxide; Black Copper Oxide
Chemical Family: Copper Compounds
Formula: CuO
Formula Wt.: 79.55
CAS No.: 1317-38-0
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: 1326 deg. C (2418 deg. F)
(@ 760 mmHg)
Specific Gravity: 6.40
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Black crystalline powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures: None identified.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: None identified
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): 0.2 mg/m³

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TLV Is For Copper, Fume, As Cu.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.1 mg/m³

PEL Is For Copper Fume, As Cu.

Toxicity Of Components: No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, lungs, eyes, skin

Medical Conditions Generally Aggravated By Exposure: Wilson's disease

Primary Routes Of Entry: Inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 15 ppm, a high-efficiency particulate respirator is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

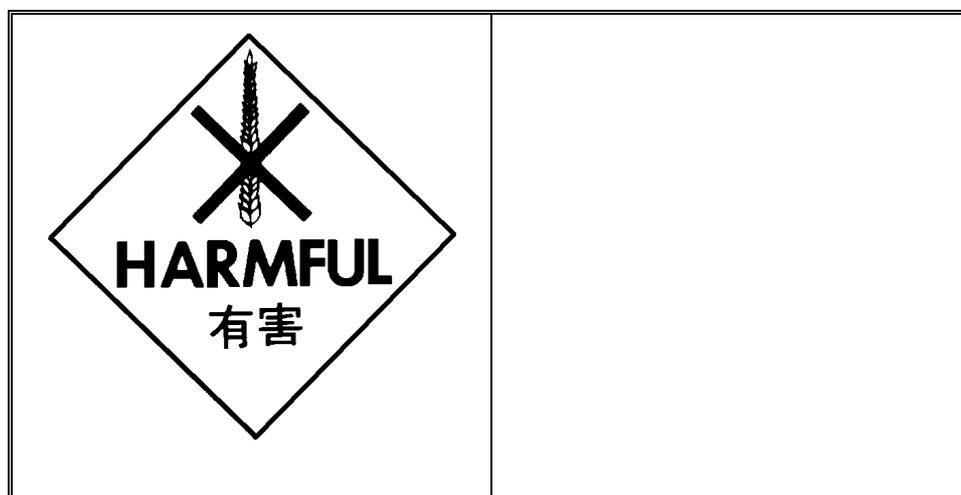
The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS CUPRIC SULFATE, 5-HYDRATE 0210**PRODUCT INFORMATION**

Product Name: Cupric Sulfate, 5-Hydrate
Chinese Name: 硫(VI)酸銅(II)
Common Synonyms: Copper (II) Sulfate, Pentahydrate; Blue Vitriol
Chemical Family: Copper Compounds
Formula: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
Formula Wt.: 249.68
Cas No.: 7758-99-8
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A
Melting Point: 653 deg. C (1207 deg. F) Decomposes Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 2.28
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Blue crystals or granules. Odorless.

Vapor Pressure (mmHg): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: Note: decomposes at melting point.
Toxic Gases Produced: Sulfur dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Strong reducing agents, strong oxidizing agents, magnesium
Decomposition Products: Oxides of sulfur

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract, irritation of mucous membranes
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified

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Ingestion: Nausea, vomiting, diarrhea, gastrointestinal pain

Chronic Effects: Blood damage

Threshold Limit Value (TLV/TWA): 1 mg/m³

TLV Is For Copper, Dusts And Mists, As Cu.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 1 mg/m³

PEL Is For Copper Dust And Mist, As Cu.

Toxicity Of Components:

Oral Rat LD₅₀ For Cupric Sulfate, 5-Hydrate

300 mg/kg

Intraperitoneal Mouse LD₅₀ For Cupric Sulfate, 5-Hydrate

33 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, Skin, blood

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Skin contact: in case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 8 ppm, a dust/mist respirator is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**D-(-)-FRUCTOSE****0211****PRODUCT INFORMATION**

Product Name: D-(-)-Fructose
Chinese Name: D-(-)-果糖
Common Synonyms: D-Fructopyranose
Chemical Family: Carbohydrates And Polysaccharides
Formula: $\text{OCH}_2(\text{CHOH})_3\text{COHCH}_2\text{OH}$
Formula Wt.: 180.16
CAS No.: 57-48-7
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A
Melting Point: 103 deg. C (217 deg. F)
(@ 760 mmHg)
Specific Gravity: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: None identified
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified

The above information is believed to be accurate to the best of our knowledge.
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Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**IRON POWDER****0212****PRODUCT INFORMATION**

Chemical Name : Iron Powder

Chinese Name: 鐵

Formula : Fe

CAS.: 7439-89-6

RISK SYMBOL

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PHYSICAL DATA

Boiling Point: 5432 deg. F

Vapor Pressure (mm Hg.): 1 mm @ 1787 deg. C

Vapor Density (AIR = 1): N/A

Specific Gravity (H₂O = 1): Apparent density 2.55-2.90 g/cm

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Melting Point: 2,795 deg. F
Evaporation Rate (Butyl Acetate = 1): N/A
Solubility in Water: None - rusts
Appearance and Odor: Silver-greyish to black in color; odor >> none

FIRE AND EXPLOSION DATA

Flash Point (Method Used): N/A
Flammable Limits: Not known LEL UEL
Extinguishing Media : Water or CO₂ foam or dry chemical extinguishing agents
Special Fire Fighting Procedures : Regular procedures

REACTIVITY DATA

Stability : Stable
Hazardous Polymerization : Will not occur
Incompatibility (Materials to Avoid) :
Violently combustible when mixed with oxidizing agents (ex: potassium chlorate, sodium nitrate)

Hazardous Decomposition or Byproducts : If exposed to strong acids will release hydrogen

HEALTH HAZARD DATA

Health Hazards (Acute and Chronic) :
As for sand or grit or other fine granular substances, iron powder can be Irritant to eyes and respiratory system. Annual chest X-Rays of our Plant workers including those with 20 years service give negative Results.

Carcinogenicity: None
Signs and Symptoms of Exposure : Irritation of eyes and possibly of respiratory tract.
Medical Conditions Generally Aggravated by Exposure : Not known

FIRST AID MEASURES

To remove iron particles from eyes; bathe eyes as for sand or grit. Use of magnet possible.

PREVENTATIVE MEASURES

Respiratory Protection (Specify Type) : Filter type dust masks may be worn ***

Ventilation : Local exhaust

Protective Gloves: None

Eye Protection: Safety type glasses optional

Other Protective Clothing or Equipment None

Work/Hygienic Practices Regular

Precautions to Be Taken in Handling and Storing : Normal good plant housekeeping

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In Case Material Is Released Or Spilled :

Normal plant housekeeping procedures to remove spilled materials, Sweeping, shovelling, magnetic pick-ups, etc...

Material Safety Data Sheet

City University of Hong Kong

MSDS FERROUS SULFATE, 7-HYDRATE 0213**PRODUCT INFORMATION**

Product Name: Ferrous Sulfate, 7-Hydrate

Chinese Name: 硫酸亞鐵

Common Synonyms: Iron (II) Sulfate, Heptahydrate; Copperas; Green Vitriol

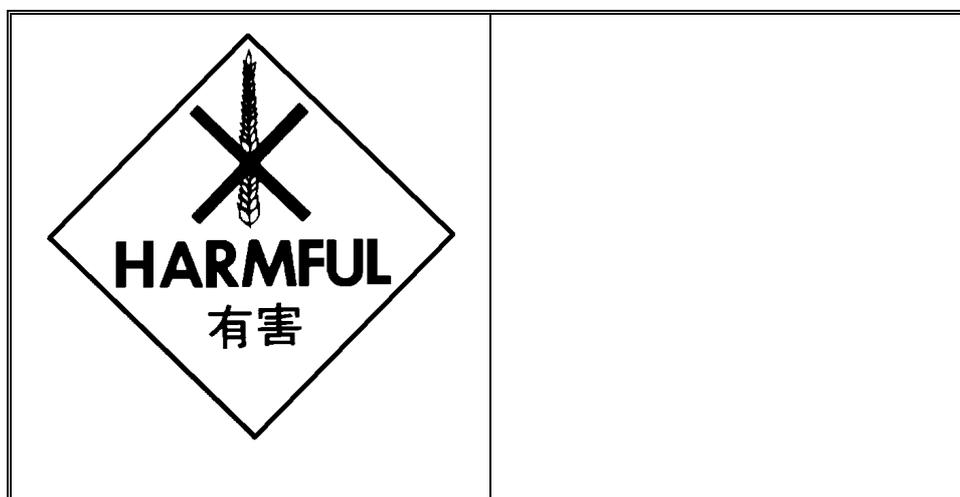
Chemical Family: Iron Compounds

Formula: $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

Formula Wt.: 278.02

CAS No.: 7782-63-0

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: 1.90
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Blue-Green Crystals Or Granules. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Sulfur dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles: Strong bases, carbonates, potassium
Decomposition Products: Oxides of sulfur

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: None identified

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 1 mg/m³

TLV Is For Iron Salts, Soluble, As Fe.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 1 mg/m³

PEL Is For Iron Salts, Soluble, As Fe.

Toxicity Of Components:

Oral Mouse LD₅₀ For Ferrous Sulfate, 7-Hydrate

1520 mg/kg

Intravenous Mouse LD₅₀ For Ferrous Sulfate, 7-Hydrate

51 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/skin protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

Special Precautions: Note: do not use product if it is coated with brownish yellow basic sulfate.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS FERRIC NITRATE, 9-HYDRATE 0214**PRODUCT INFORMATION**

Product Name: Ferric Nitrate, 9-Hydrate

Chinese Name: 硝酸鐵

Common Synonyms: Nitric Acid, Iron (3+) Salt; Iron (III) Nitrate, Nonahydrate; Iron Nitrate

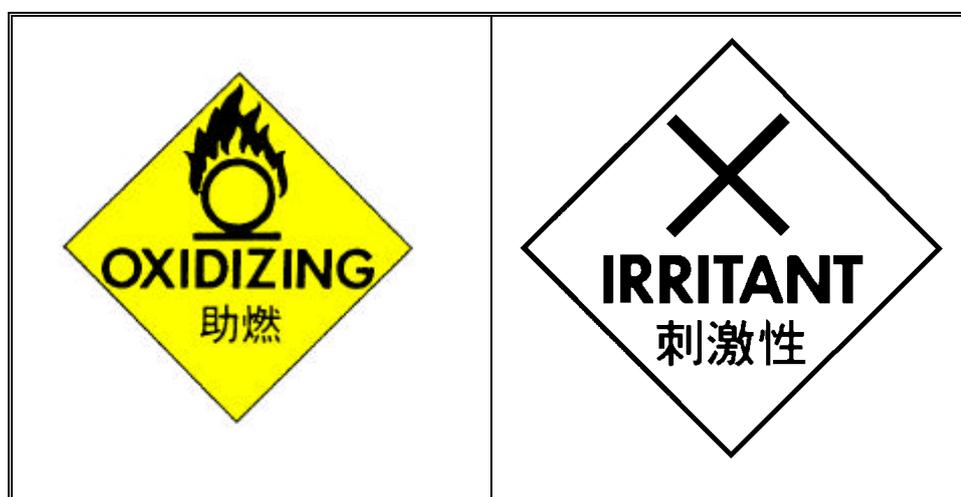
Chemical Family: Iron Compounds

Formula: $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$

Formula Wt.: 404.00

CAS No.: 7782-61-8

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 47 deg. C (116 deg. F) Vapor Density (Air=1): 14.0
(@ 760 mmHg)
Specific Gravity: 1.68 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Gray to light purple crystals. Faint acid odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Closed containers exposed to heat may explode.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, shock, friction
Incompatibles: Strong reducing agents, most common metals, combustible materials, organic materials
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract

Skin Contact: Severe irritation or burns

Eye Contact: Severe irritation or burns

Skin Absorption: None identified

Ingestion: Gastrointestinal irritation

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 1 mg/m³

TLV Is For Iron Salts, Soluble, As Fe.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 1 mg/m³

PEL Is For Iron Salts, Soluble, As Fe.

Toxicity Of Components:

Oral Rat LD₅₀ For Ferric Nitrate, Nonahydrate

3250 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure:

Damaged skin, eye disorders, respiratory system disease

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. Induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin contact: in case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**FERRIC OXIDE****0215****PRODUCT INFORMATION**

Product Name: Ferric Oxide

Chinese Name: 氧化鐵

Common Synonyms: Iron (III) Oxide; Red Iron Oxide; C.I. 77491; Iron Sesquioxide

Chemical Family: Iron Compounds

Formula: Fe_2O_3

Formula Wt.: 159.69

CAS No.: 1309-37-1

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Boiling Point: N/A
Melting Point: 1565 deg. C (2849 deg. F)
(@ 760 mmHg)
Specific Gravity: 5.24
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Red to brown powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)
Physical State: Solid

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Iron fumes

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: Hydrazine, calcium hypochlorite, performic acid
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Prolonged contact may cause irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified

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Chronic Effects: Lung damage

Threshold Limit Value (TLV/TWA): 5 mg/m³

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 10 mg/m³

Toxicity Of Components:

Intraperitoneal Rat LD₅₀ For Ferric Oxide

5500 mg/kg

Intraperitoneal Mouse LD₅₀ For Ferric Oxide

5400 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, lungs

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS

LEAD FOIL

0216

PRODUCT INFORMATION

Chemical Name : Lead Foil

Chinese Name: 鉛

Formula : Pb

CAS : 7439-92-1

RISK SYMBOL



PHYSICAL DATA

Boiling Point:..... N/A

Vapor Pressure:..... N/A

Vapor Density: N/A

Evaporation Rate:..... N/A

City University of Hong Kong

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Solubility In Water: N/A
Sp. Gravity:..... N/A
Percent Volatile: N/A
Volatile Organics: N/A
Voc Less H₂O & Exempt Solvent N/D
pH: N/A
Viscosity: N/A
Melting Point..... N/D
Appearance And Odor: Lead foil, silver color

FIRE AND EXPLOSION DATA

Flash Point:..... N/A
Flammable Limits - LEL: N/A
Flammable Limits - UEL: N/A
Autoignition Temperature: ... N/A
Extinguishing Media: Water, carbon dioxide, dry chemical, foam
Special Fire Fighting Procedures: Not applicable
Unusual Fire And Explosion Hazards: Not applicable.

REACTIVITY DATA

Stability: Stable
Incompatibility - Materials To Avoid: Strong oxidizing agents
Hazardous Polymerization: Will not occur
Hazardous Decomposition Products: Not applicable.

HEALTH HAZARD DATA

Lead Foil..... 0.15 mg/m³ TWA ACGIH as Pb dust or fume
Lead Foil..... 0.05 mg/m³ TWA OSHA as Pb
Eye Contact: No adverse health effects are expected from eye contact.
Mechanical Eye Irritation:
Signs/symptoms can include irritation, redness, scratching of the cornea and tearing.

Skin Contact:
Mild Skin Irritation (After Prolonged Or Repeated Contact):
Signs/symptoms can include redness, swelling, and itching.

Mechanical Skin Irritation:

Signs/symptoms can include itching and redness. Excessive skin contact and poor hygiene could result in accidental ingestion of lead. See symptoms and health effects of lead under ingestion.

Inhalation:

No adverse health effects are expected from inhalation exposure. Health effects from inhalation are not expected unless product is heated. Vapors of heated material may cause respiratory system irritation. Dust from cutting, grinding, sanding or machining may cause irritation of the respiratory system.

While the following effects are associated with one or more of the individual ingredients in this product and are required to be included on the msds by the U.S. OSHA hazard communication standard, they are not expected effects during foreseeable use of this product.

Prolonged Or Repeated Overexposure, Above Recommended Guidelines, May Cause:

Blood Disorders: signs/symptoms can include prolonged weakness and fatigue.

Kidney Effects: Signs/symptoms can include reduced urine volume, blood in urine and back pain.

Liver Effects: Signs/symptoms can include yellow skin(jaundice) and tenderness of upper abdomen.

If Swallowed:

Anemia (Decreased Number Of Red Blood Cells Or Amount Of Hemoglobin):

Signs/symptoms can include prolonged weakness and fatigue.

Irritation of Gastrointestinal Tissues:

Signs/symptoms can include pain, vomiting, abdominal tenderness, nausea, blood in vomitus, and blood in feces.

Peripheral Neuropathy:

Signs/symptoms can include tingling of extremities, incoordination, numbness, weakness and tremors.

Lead is a cumulative poison. Absorption of lead is influenced by the diet.

While the following effects are associated with one or more of the individual ingredients in this product and are required to be included on the msds by the U.S. OSHA hazard communication standard, they are not expected effects during foreseeable use of this product.

Blood disorders: Signs/symptoms can include prolonged weakness and fatigue.

Heart Effects: Signs/symptoms can include arrhythmia, heart attack and death.

Immune System Impairment (immunosuppression):

Signs/symptoms can include inability to fight infections.

Kidney Effects: Signs/symptoms can include reduced urine volume, blood in urine and back pain.

Liver Effects: Signs/symptoms can include yellow skin(jaundice) and tenderness of upper abdomen.

Cancer:

Lead (Elemental) (7439-92-1) is a potential cancer hazard causing kidney cancer by the dietary and parenteral routes of exposure in laboratory animal studies (NTP anticipated human carcinogen, IARC possible human carcinogen 2B).

Reproductive/Developmental Toxins:

Lead (7439-92-1) is a reproductive hazard causing behavioral defects, teratogenicity, fetotoxicity, and male reversible fertility effects based on human experience (California Proposition 65).

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FIRST AID MEASURES

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Eye Contact:

Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin Contact: Flush skin with large amounts of water. If irritation persists, get medical attention.

Inhalation: No need for first aid is anticipated.

If Swallowed: Do not induce vomiting. Drink two glasses of water. Call a physician.

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PREVENTATIVE MEASURES

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Eye Protection: Avoid eye contact.

Skin Protection: Avoid skin contact..

Ventilation Protection: Not applicable.

Respiratory Protection: Not applicable..

Prevention Of Accidental Ingestion:

Do not eat, drink or smoke when using this product. Wash exposed areas thoroughly with soap and water. Wash hands after handling and before eating. Do not ingest.

Recommended Storage:

Store away from areas where product may come into contact with food Or pharmaceuticals. Keep out of the reach of children.

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ENVIRONMENTAL PROTECTION DATA

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Spill Response: Not applicable.

Recommended Disposal: Dispose of waste product in a hazardous waste facility. Reclaim if feasible.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD CARBONATE****0217****PRODUCT INFORMATION**

Product Name: Lead Carbonate
Chinese Name: 碳酸鉛(II)
Common Synonyms: N/A
Chemical Family: Lead Compounds
Formula: PbCO_3
Formula Wt.: 267.20
CAS No.: 598-63-0
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: 400 deg. C (752 deg. F) Decomposes Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 6.60 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards:
Contact with strong oxidizers may cause fire or explosion. Note: decomposes at melting point.
Toxic Gases Produced: Lead fumes, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles: Strong acids, strong oxidizing agents
Decomposition Products: Lead fumes, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation

The above information is believed to be accurate to the best of our knowledge.
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Eye Contact: Irritation

Skin Absorption: None identified

Ingestion:

Headache, nausea, vomiting, gastrointestinal irritation, convulsions, unconsciousness, loss of appetite, weight loss, constipation, anemia, and may be fatal

Chronic Effects: Anemia, kidney damage, blurred vision, lead build-up in the central nervous system

Threshold Limit Value (TLV/TWA): 0.15 mg/m³

TLV Is For Lead, Inorganic Dusts And Fumes, As Pb.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.05 mg/m³

PEL Is For Lead, Inorganic Dusts And Fumes, As Pb.

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: Yes

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Gi tract, central nervous system, gingival tissue, kidneys, blood

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Skin contact: in case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a high-efficiency particulate respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in secure poison area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD CHLORIDE****0218****PRODUCT INFORMATION**

Product Name: Lead Chloride
Chinese Name: 氯化鉛(II)
Common Synonyms: Lead (II) Chloride; Lead Dichloride
Chemical Family: Lead Compounds
Formula: PbCl_2
Formula Wt.: 278.10
CAS No.: 7758-95-4
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: 950 deg. C (1742 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 501 deg. C (933 deg. F) Vapor Density (Air=1): 9.6
(@ 760 mmHg)
Specific Gravity: 5.85 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Moderate (1-10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystalline powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards: Can be an explosion hazard, especially when heated.
Toxic Gases Produced: Lead fumes, chlorine, hydrogen chloride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame
Incompatibles: None identified
Decomposition Products: Lead fumes, hydrogen chloride

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: May be harmful

Ingestion:

Headache, nausea, vomiting, gastrointestinal irritation, convulsions, unconsciousness, and may be fatal

Chronic Effects: Anemia, kidney damage, blurred vision, lead build-up in the central nervous system

Threshold Limit Value (TLV/TWA): 0.15 mg/m³

TLV Is For Lead, Inorganic Dusts And Fumes, As Pb.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.05 mg/m³

PEL Is For Lead, Inorganic Dusts And Fumes, As Pb.

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: Yes

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Gi tract, central nervous system, gingival tissue, kidneys, blood

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact, absorption

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Skin contact: in case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a high-efficiency particulate respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in secure poison area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD OXIDE****0219****PRODUCT INFORMATION**

Product Name: Lead Oxide

Chinese Name: 氧化鉛(II)

Common Synonyms: Lead (II) Oxide; Lead Monoxide; Lead Oxide, Yellow

Chemical Family: Lead Compounds

Formula: PbO

Formula Wt.: 223.19

CAS No.: 1317-36-8

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A Vapor Pressure (mmHg): N/A
Melting Point: 888 deg. C (1630 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 9.53 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Yellow to red powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Lead fumes

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat
Incompatibles:
Strong reducing agents, combustible materials, chemically active metals, aluminum, sodium
Decomposition Products: Lead fumes

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion:

Headache, nausea, vomiting, gastrointestinal irritation, convulsions, unconsciousness, and may be fatal

Chronic Effects:

Anemia, kidney damage, blurred vision, lead build-up in the central nervous system

Threshold Limit Value (TLV/TWA): 0.15 mg/m³

TLV Is For Lead, Inorganic Dusts And Fumes, As Pb.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 0.05 mg/m³

PEL Is For Lead, Inorganic Dusts And Fumes, As Pb.

Toxicity Of Components:

Intraperitoneal Rat LD₅₀ For Lead Oxide

430 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: Yes

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Gi tract, central nervous system, gingival tissue, kidneys, blood

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a high-efficiency particulate respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in secure poison area.

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ENVIRONMENTAL PROTECTION DATA

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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LITHIUM CHLORIDE****0220****PRODUCT INFORMATION**

Product Name: Lithium Chloride

Chinese Name: 氯化鋰

Common Synonyms: Hydrochloric Acid, Lithium Salt

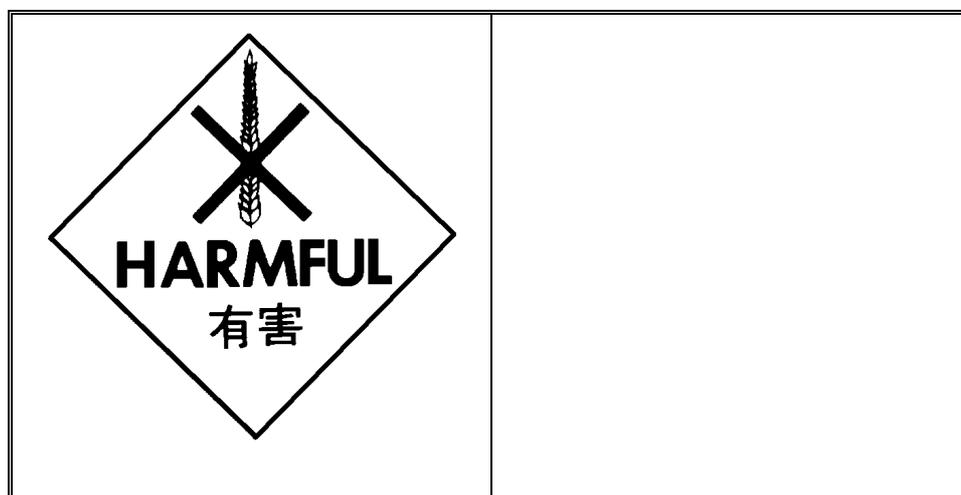
Chemical Family: Lithium Compounds

Formula: LiCl

Formula Wt.: 42.39

CAS No.: 7447-41-8

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: 1355 deg. C (2471 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 608 deg. C (1126 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 2.07 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White solid. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Hydrogen chloride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles: Strong acids, bromine trifluoride and trichloride
Decomposition Products: Hydrogen chloride

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract, irritation of mucous membranes
Skin Contact: Irritation
Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Gastrointestinal irritation, nausea, vomiting, diarrhea

Chronic Effects: Kidney damage, central nervous system depression

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Lithium Chloride 526 mg/kg

Intraperitoneal Rat LD₅₀ For Lithium Chloride 514 mg/kg

Subcutaneous Rat LD₅₀ For Lithium Chloride 499 mg/kg

Intravenous Mouse LD₅₀ For Lithium Chloride 363 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: Tests on laboratory animals indicate material may be teratogenic.

Target Organs: Gi tract, central nervous system, kidneys

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, give large amounts of water. induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Isolate from incompatible materials.

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ENVIRONMENTAL PROTECTION DATA

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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LITHIUM****0221****PRODUCT INFORMATION**

Chemical Name: Lithium

Chinese Name: 鋰

CAS # : 7439-93-2

RISK SYMBOL**PHYSICAL DATA**

Boiling Point : 714 deg. C
% Volatile by Vol: Not applicable
Bulk Dens./Spec. Grav: 0.53 g/cc
pH Level: Not applicable
Vapor Pressure: Not applicable

City University of Hong Kong

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Coef. H₂O/Oil Dist.: Not available
Melting Point: Not available
Freezing Point : Not available
Molecular Weight: Not available
Odour Threshold Conc.: Not available
Vapor Density (Air=1): Not applicable
Evaporation Rate: Not applicable Vs.: Not applicable
Solubility In Water: Reacts with water.
Appearance, Odour : Lithium is a silvery-white, soft metallic solid with no odour.

FIRE AND EXPLOSION DATA

Flash Point And Method: Not available
Auto-Ignition Temperature : Not available
Lower Explosion Limit: Not available
Upper Explosion Limit: Not available
Means Of Extinction :
Do not use water, sand or CO₂ to fight fire. Use graphite, lith-x (ansul). If not available, use dry sodium chloride, dry (anhydrous) calcium, dry lithium chloride.

Special Procedures :
Due to possibility of toxic fume, if involved in fire wear self contained breathing apparatus.

Hazardous Combustion Products :
Corrosive lithium oxide and/or lithium hydroxide fumes may be released.

REACTIVITY DATA

Stability? Stable
Hazardous Polymerization Will not occur.
Incompatibility To Other Substances :
If the cartridge seal is broken, the lithium metal is incompatible with moisture, acids, oxidizers, nitrogen, oxygen and carbon dioxide.

Hazardous Decomposition Products :
Reacts violently with many materials. With water, reacts to give off flammable hydrogen gas and heat.

HEALTH HAZARD DATA

Acute: If cartridge seal is broken, lithium is corrosive.

Signs And Symptoms Of Exposure : Burns

FIRST AID MEASURES

Eyes: Flush with copious amounts of water; consult physician immediately.

Skin: Wash with soap and water; if irritation persists, consult physician.

Inhalation: Remove person to fresh air; consult physician as soon as possible.

Ingestion: Do not induce vomiting; consult physician immediately.

PREVENTATIVE MEASURES

Respiratory Protection : Not applicable

Ventilation : Not applicable

Engineering Controls: Not applicable

Gloves: Insulating gloves

Eye: Goggles

Clothing/Equipment:

Wear full flame resistant face shield and body protective clothing when adding cartridges to molten metal bath.

Work/Hygiene Practices : Practice good housekeeping and good personal hygiene.

Precautions To Be Taken In Handling And Storing :

Store in a dry, cool area, away from water, acids and oxidizing materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In Case Material Is Released Or Spilled :

If cartridge seal is broken, and in order to prevent ignition, coat with mineral oil (or kerosene), soaking thoroughly and place in oiled steel drums, closing securely and tightly.

Material Safety Data Sheet

City University of Hong Kong

MSDS**MAGNESIUM, RIBBON****0223****PRODUCT INFORMATION**

Product Name: Magnesium, Ribbon

Chinese Name: 鎂帶

Common Synonyms: N/A

Chemical Family: Metals

Formula: Mg

Formula Wt.: 24.30

CAS No.: 7439-95-4

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: 1107 deg. C (2024 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 650 deg. C (1202 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 1.74 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Decomposes % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Silver metallic strips.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 634 deg. C (1175 deg. F) Nfpa 704m Rating: 0-1-2 W
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Smother with dry soda ash. Never use water or chemical fire extinguishers.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool. Burns with a very bright flame, fire glasses must be worn.
Unusual Fire & Explosion Hazards:
Reacts violently with water producing highly flammable vapors. Contact with strong oxidizers may cause fire or explosion. Dust may form explosive mixture with air.
Toxic Gases Produced: Hydrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will Not Occur
Conditions To Avoid: Moisture, Heat, Flame, Other Sources Of Ignition
Incompatibles: Strong oxidizing agents, strong acids, water, halogens, cyanides
Decomposition Products: Hydrogen

HEALTH HAZARD DATA

Inhalation:

Irritation of mucous membranes, tightness and pain in chest, coughing, difficult breathing, leukocytosis

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 10 mg/m³

TLV Is For Magnesium Oxide Fume.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory System, Eyes

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: In case of contact, flush skin with water.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, a dust/mist respirator is recommended. If concentration exceeds capacity of respirator, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store away from water or locations where water may be used to extinguish fire. Store in a cool, well-ventilated area away from sources of heat, flame, or ignition.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Shut off ignition sources; no flares, smoking, or flames in area. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Chinese Name:
Material Safety Data Sheet

City University of Hong Kong

MSDS MAGNESIUM SULFATE, 7-HYDRATE 0224

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PRODUCT INFORMATION

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Product Name: Magnesium Sulfate, 7-Hydrate
Chinese Name: 硫(VI)酸鎂
Common Synonyms: Magnesium Sulfate, Heptahydrate
Chemical Family: Magnesium Compounds
Formula: $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
Formula Wt.: 246.48
CAS No.: 10034-99-8
Product Use: Laboratory Reagent

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RISK SYMBOL

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PHYSICAL DATA

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Physical State: Solid
Boiling Point: N/A
Melting Point: 250 deg. C (482 deg. F)
(@ 760 mmHg)
Specific Gravity: 1.05
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Clear, colorless crystals. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Sulfur dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Air, heat
Incompatibles: None identified
Decomposition Products: Oxides of sulfur

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation
Eye Contact: Irritation

Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
Subcutaneous Mouse LD₅₀ For Magnesium Sulfate, 7-Hydrate 980 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:
In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:
None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**MANGANESE CHLORIDE****0225****PRODUCT INFORMATION**

Chemical Name : Manganese Chloride Tetrahydrate

Chinese Name: 氯化錳(II)

Synonyms: Manganous Chloride Tetrahydrate; Manganese dichloride

Chemical Family: Inorganic Salt

Chemical Formula: $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$

Product Use: Laboratory Reagent

CAS No. : 13446-34-9

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

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Odour and Appearance: Reddish-pink, odourless crystals.
Odour Threshold (ppm): Not applicable
Vapour Pressure (mm Hg): Not applicable
Vapour Density (Air=1): Not applicable
Evaporation Rate: Not applicable
Boiling Point : 198 deg. C
Melting Point : 58 deg. C
pH: 5.0-6.0 (5% solution)
Specific Gravity: 2.01
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Nonflammable
Extinguishing Media: Use an extinguisher appropriate to the surrounding material that is burning.
Flash Point (Method Used): Not applicable
Autoignition Temperature: Not applicable
Upper Flammable Limit (% by volume): Not applicable
Lower Flammable Limit (% by volume): Not applicable
Hazardous Combustion Products: Toxic fumes
Sensitivity to Impact: None
Sensitivity to Static discharge: None

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances: Strong reducing agents, potassium, sodium, zinc
Reactivity: Deliquescent. Excessive heat will cause decomposition.
Hazardous Decomposition Products: Mits toxic fumes of chloride when heated to decomposition.

HEALTH HAZARD DATA

Toxicological Data:
LD₅₀: (oral, rat) 1484 mg/kg
LC₅₀: Not available

Inhaled: May cause irritation. Inhalation may irritate the respiratory tract.
In Contact With Skin: No effects expected. Assumed harmful if absorbed by the skin.
In Contact With Eyes: May cause irritation

Ingested:

Harmful. Ingestion may cause abdominal pain, nausea, hypoglycemia, and decreases calcium blood levels.

Carcinogenicity: No information available

Teratogenicity: No information available

Reproductive Effects: No information available

Mutagenicity: No information available

Synergistic Products: None known

FIRST AID MEASURES

Eyes: Wash thoroughly with water. Get medical advice if irritation develops.

Skin:

Remove contaminated clothing. Wash skin with plenty of water for at least fifteen (15) minutes. If irritation develops seek medical attention.

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Rinse mouth thoroughly with water. Do not induce vomiting. Have victim drink 220-400 ml of water to dilute. Seek medical attention.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation recommended

Respiratory Protection:

Dust mask. Approved air-purifying respirator or self-contained breathing apparatus for exposures exceeding TLV.

Eye Protection: Chemical safety goggles or face shield.

Skin Protection: Plastic apron, sleeves and boots as appropriate. Rubber or plastic gloves.

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures and Equipment: Follow routine safe handling procedures. Avoid generating dust.

Storage Requirements:

Store in suitable labelled containers. Keep containers tightly closed when not in use and when empty. Protect from damage. Store in a cool, dry, well-ventilated area, out of direct sunlight. Protect from moisture.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Mix with sand, transfer carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

Waste Disposal:

Store in suitable labelled containers. Keep containers tightly closed when Not in use and when empty. Protect from damage. Store in a cool, dry, Well-ventilated area, out of direct sunlight. Protect from moisture.

Material Safety Data Sheet

City University of Hong Kong

MSDS**MANGANESE DIOXIDE****0226****PRODUCT INFORMATION**

Product Name: Manganese Dioxide

Chinese Name: 氧化錳(IV)

Common Synonyms: Black Manganese Oxide; Cement Black; Manganese (IV) Oxide

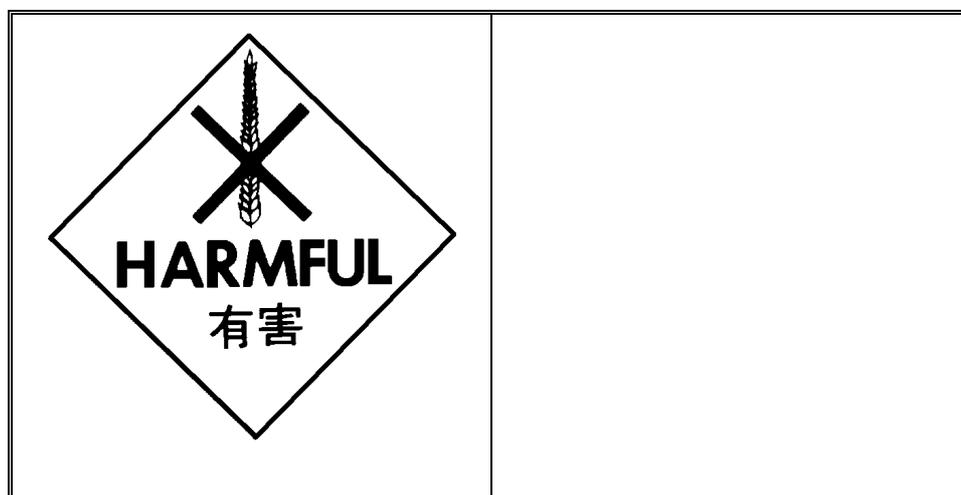
Chemical Family: Manganese Compounds

Formula: MnO_2

Formula Wt.: 86.94

CAS No.: 1313-13-9

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: N/A
Melting Point: 535 deg. C (995 deg. F)
(@ 760 mmHg)
Specific Gravity: 5.02
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Black crystalline powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: N/A
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move exposed containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion.

Toxic Gases Produced: None identified

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition
Incompatibles:
Strong oxidizing agents, strong acids, strong reducing agents, nitrates, combustible materials, hydrogen peroxide, azides, chlorine, chlorates, chlorine trifluoride

Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation:

Irritation of upper respiratory tract, excessive inhalation may cause nausea, weakness, chills, loss of appetite, manganism

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Central nervous system depression

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 5 mg/m³

TLV Listed Denotes Ceiling Limit.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Respiratory system, central nervous system, blood, kidneys

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Ingestion, inhalation

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Keep combustibles (wood, paper, oil, etc.) Away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS METHYL ORANGE pH INDICATOR 0227**PRODUCT INFORMATION**

Chemical Name : Methyl Orange pH Indicator
Chinese Name: 甲基橙
Synonyms : Methyl Orange pH Indicator
Chemical Family: Azo Dye
Chemical Formula: $C_{14}H_{14}N_3SO_3Na$
Product Use: Laboratory Solvent
CAS No. : 547-58-0

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

City University of Hong Kong

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Odour and Appearance: Yellow-orange powder or crystals; odourless
Odour Threshold (ppm): Not available
Vapour Pressure (mm Hg): Not available
Vapour Density (Air=1): Not applicable
Evaporation Rate: Not applicable
Boiling Point : Not available
Melting Point : Not available
pH: Not available
Specific Gravity: Not available
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Nonflammable
Extinguishing Media: Water spray, foam, CO₂
Flash Point (Method Used): None
Autoignition Temperature: Not available
Upper Flammable Limit (% by volume): Not available
Lower Flammable Limit (% by volume): Not available
Hazardous Combustion Products: None known
Sensitivity to Impact: None
Sensitivity to Static discharge: None

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances: Oxidizers
Reactivity: Stable
Hazardous Decomposition Products: Toxic fumes of nitrogen, sulphur, sodium and carbon compounds.

HEALTH HAZARD DATA

Toxicological Data:
LD₅₀: (oral, rat) 60 mg/kg
LC₅₀: Not available

Inhaled: May be harmful
In contact with skin: May irritate. May be harmful if absorbed.
In contact with eyes: Irritates
Ingested: Toxic

Carcinogenicity: Suspected carcinogen
Teratogenicity: No information available
Reproductive Effects: No information available
Mutagenicity: Mutation references cited
Synergistic Products: None found

FIRST AID MEASURES

Eyes: Wash thoroughly with water. Get medical advice if irritation develops.

Skin:

Remove contaminated clothing. Wash skin with plenty of water for at least fifteen (15) minutes. If irritation develops seek medical attention.

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Rinse mouth thoroughly with water. Do not induce vomiting. Have victim drink 220-400 ml of water to dilute. Seek medical attention.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation recommended

Respiratory Protection: Dust mask, self-contained breathing apparatus as appropriate.

Eye Protection: Chemical safety goggles

Skin Protection: Plastic apron, sleeves and boots as appropriate. Rubber gloves.

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures and Equipment: Follow routine safe handling procedures. Avoid generating dust.

Storage Requirements:

Store in suitable labelled containers. Keep containers tightly closed when not in use and when empty. Protect from damage. Store in a cool, dry, well-ventilated area, out of direct sunlight.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Transfer carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS METHYL RED pH INDICATOR 0228**PRODUCT INFORMATION**

Chemical Name : Methyl Red, pH Indicator

Chinese Name: 甲基紅

Synonyms : Methyl Red, pH Indicator

Chemical Family: Mono Azo Dye

Chemical Formula: $C_{15}H_{14}N_3O_2Na$

Product Use: Laboratory Reagent

CAS No. : 845-10-3

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

City University of Hong Kong

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Odour and Appearance: Orange-red powder; odourless
Odour Threshold (ppm): Not applicable
Vapour Pressure (mm Hg): Not available
Vapour Density (Air=1): Not available
Evaporation Rate: Not available
Boiling Point : Not available
Freezing Point : Not available
pH: Not available
Specific Gravity: Not available
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Noncombustible
Extinguishing Media: Use an extinguisher appropriate to the surrounding material that is burning.
Flash Point (Method Used): None
Autoignition Temperature: Not available
Upper Flammable Limit (% by volume): Not available
Lower Flammable Limit (% by volume): Not available
Hazardous Combustion Products: None known
Sensitivity to Impact: None
Sensitivity to Static discharge: None

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances: Reducing agents
Reactivity: Extreme heat and ignition sources
Hazardous Decomposition Products: CO_x, nitrogen compounds

HEALTH HAZARD DATA

Toxicological Data:
LD₅₀: Not available
LC₅₀: Not available
Inhaled: May be harmful
In contact with skin: No information available
In contact with eyes: No information available
Ingested: May be harmful
Carcinogenicity: No information available

Teratogenicity: No information available
Reproductive Effects: No information available
Mutagenicity: May cause adverse mutagenic effects
Synergistic Products: None found

FIRST AID MEASURES

Eyes: Wash thoroughly with water. Get medical advice if irritation develops.

Skin:

Remove contaminated clothing. Wash skin with plenty of water for at least fifteen (15) minutes. If irritation develops seek medical attention.

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Rinse mouth thoroughly with water. Do not induce vomiting. Have victim drink 220-400 ml of water to dilute. Seek medical attention.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation recommended

Respiratory Protection: Dust mask or self-contained breathing apparatus as appropriate.

Eye Protection: Chemical safety goggles

Skin Protection: Plastic apron, sleeves and boots as appropriate. Neoprene gloves.

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures and Equipment: Follow routine safe handling procedures. Avoid generating dust.

Storage Requirements:

Store in suitable labelled containers. Keep containers tightly closed when not in use and when empty. Protect from damage. Store in a cool, dry, well-ventilated area, out of direct sunlight. Store away from ignition sources.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Mix with sand, transfer carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS

NICKEL

0229

PRODUCT INFORMATION

Product Name: Nickel
Chinese Name: 鎳
Common Synonyms: N/A
Chemical Family: Metals
Formula: Ni
Formula Wt.: 58.71
CAS No.: 7440-02-0
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid
Boiling Point: 2732 deg. C (4949 deg. F) Vapor Pressure (mmHg): N/A
(@ 760 mmHg)
Melting Point: 1453 deg. C (2647 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 8.90 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Gray pellets.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Nickel fumes

FIRST AID MEASURES

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: Strong acids, ammonia, aluminum, strong oxidizing agents
Decomposition Products: None identified

HEALTH HAZARD DATA

Inhalation: Headache, coughing, dizziness, difficult breathing
Skin Contact: Prolonged contact may cause dermatitis

Eye Contact: None identified
Skin Absorption: None identified
Ingestion: Headache, nausea, vomiting, dizziness, gastrointestinal irritation
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): 1 mg/m³
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): 1 mg/m³
Toxicity Of Components: no information is available
Carcinogenicity: NTP: Yes IARC: Yes Z LIST: No OSHA REG: No

Carcinogenicity:

This substance is listed as a NTP anticipated human carcinogen and an IARC probable human carcinogen (groups 2A and 2B).

Reproductive Effects: None Identified.
Target Organs: Nasal cavities, lungs, skin
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.
Respiratory Protection:
None required where adequate ventilation conditions exist. If airborne concentration exceeds TLV, a dust/mist respirator is recommended. If exceeds capacity of respirator, a self-contained breathing apparatus is advised.
Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.
Storage Requirements: Keep container tightly closed. Store in secure poison area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

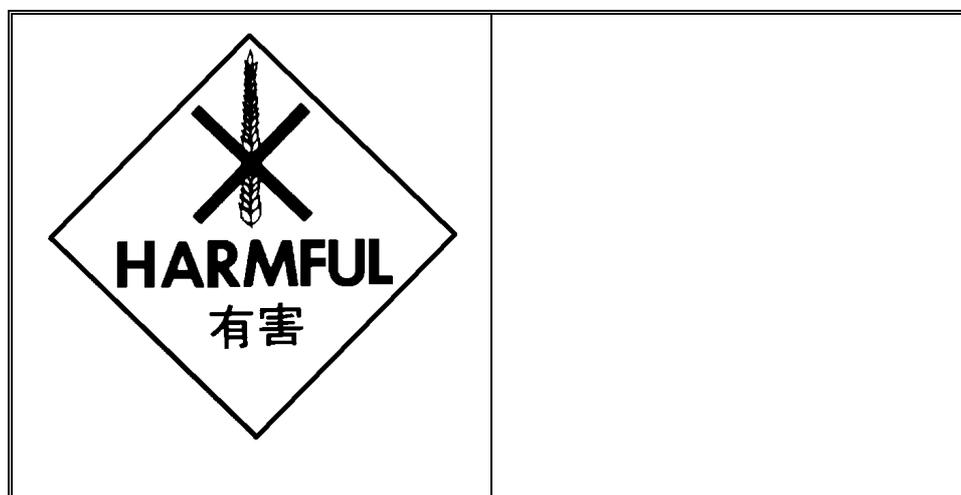
The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**NICKEL SULPHATE****0231****PRODUCT INFORMATION**

Chemical Name: Nickel Sulphate Hexahydrate
Chinese Name: 硫(VI)酸鎳(II)
Common Name/Synonym: Nickel Sulphate Hexahydrate
CAS Registry Number: 7786-81-4
Chemical Family: N/D
Formula: $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$
Molecular Weight: N/D
Product Use: Metal finishing.

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Boiling Point: N/AP
Melting Point: N/AP
Freezing Point: N/AP
Specific Gravity (Water=1): 2.07
Vapour Pressure: N/AP
Vapour Density: N/AP
pH: N/D
Solubility in Water: 62.5 g/100 cc at 0 deg. C
% Volatile: N/D
Evaporation Rate (Butyl Acetate=1): N/AP
Odour Threshold: N/AP
Coefficient of Water/Oil Distribution: N/D
Appearance and Odour: Green crystals, odourless.
Physical State: N/D

FIRE AND EXPLOSION DATA

Flash Point/Method: N/D
Lower Flammable Limit: N/D
Upper Flammable Limit: N/D
Autoignition Temperature: N/D
Extinguishing Media: Use water, carbon dioxide or foam.
Special Fire Fighting Procedures: None expected.
Unusual Fire and Explosion Hazards: Not a fire or explosion hazard.
Hazardous Combustion Products: N/D

REACTIVITY DATA

Stability: Generally considered stable.
Hazardous Polymerization: Polymerization is not expected to occur.
Conditions to Avoid: None expected.
Materials to Avoid: None expected.
Hazardous Decomposition Products: None expected.
Conditions of Reactivity: N/AP

HEALTH HAZARD DATA

Primary Routes of Exposure: Inhalation, skin and eye contact, ingestion.

Inhalation:

Causes respiratory tract irritation. Individuals hypersensitive to NICKEL may develop asthma, bronchitis, shortness of breath or wheezing.

Eye Contact: Causes eye irritation.

Skin Contact:

Causes skin irritation and sensitization or allergic reactions which may be accentuated by heat and humidity.

Ingestion: Harmful if swallowed.

Chronic Effects of Exposure: Refer to carcinogenicity.

Medical Conditions Aggravated by Exposure:

May aggravate existing medical conditions such as allergies, dermatitis, asthma, bronchitis or any other respiratory ailment.

LD₅₀ Oral (rat): N/D

LD₅₀ Dermal (rabbit): N/D

LC₅₀ (species): N/D

Carcinogenicity:

SUSPECT CANCER HAZARD. Risk of cancer depends on duration and level of exposure. Nickel and certain nickel compounds, including nickel oxide and nickel carbonate, are listed as carcinogens by the National Toxicology Program and the International Agency for Research on Cancer.

Sensitization: May cause allergic skin and respiratory reaction.

Irritancy: N/D

Reproductive Effects: N/D

Teratogenicity: N/D

Mutagenicity: N/D

Toxicologically Synergistic Products: N/D

Other Data: N/D

Environmental Effects: N/D

FIRST AID MEASURES

If Inhaled: Remove to fresh air. If breathing is difficult, give oxygen. Call a physician.

In Case of Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

In Case of Skin Contact: Flush skin with water.

If Ingested: If swallowed, induce vomiting immediately as directed by medical personnel.

PREVENTATIVE MEASURES

Ventilation (Engineering Controls):

General; local exhaust ventilation as necessary to control any air contaminants to within their TLVs during the use of this product.

Personal Protective Equipment Respiratory: A NIOSH/MSHA-approved respirator as necessary.

Eye: Chemical goggles as needed to prevent irritation.

Clothing: Body protection as necessary to prevent skin contact.

Footwear: N/D

Hands: Rubber or neoprene gloves.

Other Protective Measures: N/D

Storage and Handling Precautions and Equipment:

Wash thoroughly after handling. Avoid breathing dust. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container closed.

ENVIRONMENTAL PROTECTION DATA

Action to Take for Spills or Leaks:

Contain spillage and scoop up or vacuum. Avoid dusting. Refer to applicable provincial and local regulations for current response information.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PHENOL RED****0232****PRODUCT INFORMATION**

Product Name: Phenol Red
Chinese Name: 酚紅
Common Synonyms: Phenolsulfonphthalein
Chemical Family: Dyes, Stains, And Indicators
Formula: $C_6H_4SO_2OC(C_6H_4-4-OH)_2$
Formula Wt.: 354.39
CAS No.: 143-74-8
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: N/A
(H₂O=1)

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A

Solubility(H₂O): Slight (0.1-1%)

% Volatiles By Volume: 0
(21 deg. C)

pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Red to brown crystals.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Sulfur dioxide, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: None identified
Decomposition Products: Oxides of sulfur, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified

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Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Eye/Skin Protection:

This is a laboratory-use product for which no industrial protective equipment has been designated.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**PHENOLPHTHALEIN****0233****PRODUCT INFORMATION**

Product Name: Phenolphthalein

Chinese Name: 酚酞

Common Synonyms: 3,3-bis(p-Hydroxyphenyl)Phthalide

Chemical Family: Dyes, Stains, And Indicators

Formula: $C_{20}H_{14}O_5$

Formula Wt.: 318.33

CAS No.: 77-09-8

Product Use: Laboratory Reagent

RISK SYMBOL

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City University of Hong Kong

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

PHYSICAL DATA

Physical State: Solid

Boiling Point: N/A

Melting Point: 260 deg. C (500 deg. F)
(@ 760 mmHg)

Specific Gravity: 1.29
(H₂O=1)

Solubility(H₂O): Negligible (<0.1%)

Vapor Pressure (mmHg): N/A

Vapor Density (Air=1): 11

Evaporation Rate: N/A

% Volatiles By Volume: 0
(21 deg. C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: White to yellow powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.

Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Humidity, heat

Incompatibles: Strong oxidizing agents, alkalis

Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation, allergic reaction may develop
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: Gastrointestinal irritation
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Skin, eyes, gi tract
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM ALUM SULFATE****0234****PRODUCT INFORMATION**

Product Name: Potassium Alum

Chinese Name: <鉀>明礬, <鋁>鉀礬

Common Names/Synonyms: Potassium Alum Sulfate; Potash Alum; Alum

Formula: $K_2Al_2(SO_4)_3 \cdot 12H_2O$

CAS No.: 10043-67-1

RISK SYMBOL

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PHYSICAL DATA

Boiling Point : Not Applicable

Vapor Pressure, mmHg/20 deg. C: Not Applicable

Melting Point : Unk

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Vapor Density (Air=1): Not Applicable
Specific Gravity (Water=1): 1.75
Water Solubility, %: 10
Appearance And Odor: Clear to white powder or crystals; odorless
Evaporation Rate (Butyl Acetate=1): Not applicable

FIRE AND EXPLOSION DATA

Flash Point : None
Method Used: Not Applicable
Flammable Limits In Air, % Lower: Not applicable Upper: Not applicable
Extinguishing Media:
This material is not combustible. Use any appropriate medium for extinguishing surrounding fire.

Special Fire Fighting Procedures:
Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

Unusual Fire And Explosion Hazards: Toxic sulfur oxides may be released under fire conditions.

REACTIVITY DATA

Stability: Stable
Polymerization: Will not occur
Conditions To Avoid: None
Materials To Avoid:
Alum lowers the pH in liquid mixtures resulting in incompatibility where products of mixture are pH sensitive. Corrosive to steel and iron.

Hazardous Decomposition Products: Will liberate toxic fumes of oxides of sulfur.

HEALTH HAZARD DATA

Primary Routes Of Exposure: Skin or eye contact, inhalation.
Signs And Symptoms Of Exposure
Inhalation:
Breathing dust may irritate the nose, throat, and mucous membrane and cause coughing and chest discomfort.

Eye Contact: Dusts may irritate the eyes.

Skin Contact: Prolonged or repeated contact with the dust may irritate the skin.

Swallowed: Swallowing the dusts or solids may cause nausea and vomiting.

Chronic Effects Of Exposure: No specific information available.

Medical Conditions Generally Aggravated By Exposure: None reported.

Oral: No data found

Dermal: No data found

Inhalation: No data found

Carcinogenicity:

This material is not considered to be a carcinogen by the national toxicology program, the international agency for research on cancer, or the occupational safety and health administration.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

In Case Of Eye Contact:

Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

In Case Of Skin Contact:

Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

If Swallowed:

Do not induce vomiting. If conscious, give lots of water. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

PREVENTATIVE MEASURES

Ventilation:

Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use.

Respiratory Protection:

If use conditions generate dusts, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

Eye Protection:

Chemical goggles unless a full facepiece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

Protective Clothing: Long-sleeved shirt, trousers, safety shoes, and gloves.

Other Protective Measures: An eyewash and safety shower should be nearby and ready for use.

Storage And Handling Precautions:

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags or fiber drums dry at all times. Wash thoroughly after handling. do not get in eyes, on skin, or on clothing.

Repair And Maintenance Precautions: None.

Other Precautions:

Containers, even those that have been emptied, will retain product residue and vapors. Always obey hazard warnings and handle empty containers as if they were full.

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ENVIRONMENTAL PROTECTION DATA

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Action To Take For Spills Or Leaks:

Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a full facepiece or a half mask air-purifying cartridge respirator with particulate filters. Wear chemical goggles if a half mask is worn. For small spills, sweep up and dispose of in DOT-approved waste containers. For large spills, shovel into DOT-approved waste containers. Keep out of sewers, storm drains, surface waters, and soil.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM CARBONATE****0235****PRODUCT INFORMATION**

Product Name: Potassium Carbonate, Anhydrous

Chinese Name: 碳酸鉀

Common Synonyms: Carbonic Acid, Dipotassium Salt; Pearl Ash; Salt Of Tartar; Potash

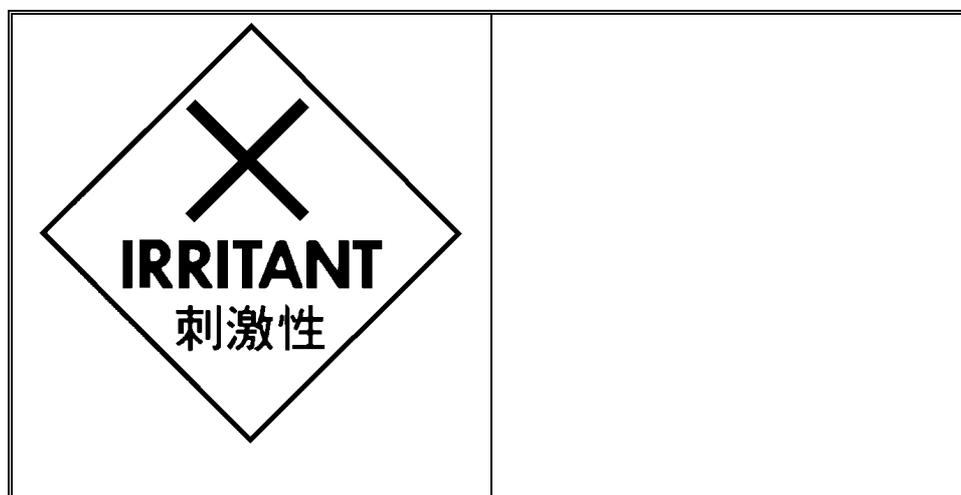
Chemical Family: Potassium Compounds

Formula: K_2CO_3

Formula Wt.: 138.21

CAS No.: 584-08-7

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Physical State: Solid
Boiling Point: N/A
Melting Point: 891 deg. C (1635 deg. F)
(@ 760 mmHg)
Specific Gravity: 2.29
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White granules. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: Note: decomposes at boiling point.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture, dusting, heat
Incompatibles: Water, strong acids
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Severe irritation or burns
Eye Contact: Severe irritation or burns
Skin Absorption: None identified

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Ingestion: Irritation and burns to mouth and stomach

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Potassium Carbonate, Anhydrous 1870 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin, mucous membranes

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water. Follow with diluted vinegar, fruit juice or whites of eggs beaten with water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Suitable for any general chemical storage area. Do not store near acids.

Special Precautions: Material is hygroscopic.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM CHLORIDE****0236****PRODUCT INFORMATION**

Product Name: Potassium Chloride

Chinese Name: 氯化鉀

Common Synonyms: Potassium Monochloride; Potassium Muriate

Chemical Family: Potassium Compounds

Formula: KCl

Formula Wt.: 74.55

CAS No.: 7447-40-7

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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Skin Absorption: None identified
Ingestion: Insomnia, may cause gastrointestinal irritation
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established

TOXICITY OF COMPONENTS:

Oral Rat LD ₅₀ For Potassium Chloride	3020 mg/kg
Oral Mouse LD ₅₀ For Potassium Chloride	383 mg/kg
Intraperitoneal Rat LD ₅₀ For Potassium Chloride	660 mg/kg
Intravenous Rat LD ₅₀ For Potassium Chloride	39 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: Kidney disorders
Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS POTASSIUM PHOSPHATE, MONOBASIC 0237**PRODUCT INFORMATION**

Product Name: Potassium Phosphate, Monobasic
Chinese Name: 原磷酸二氧鉀
Common Synonyms: Potassium Dihydrogen Phosphate
Chemical Family: Potassium Compounds
Formula: KH_2PO_4
Formula Wt.: 136.09
CAS No.: 7778-77-0
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: 2.34
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystalline powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures: None identified.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Oxides of phosphorus

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles: None identified
Decomposition Products: Oxides of phosphorus

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

No information is available

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

Special Precautions: Material is hygroscopic.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM BICARBONATE****0238****PRODUCT INFORMATION**

Product Name: Potassium Bicarbonate

Chinese Name: 碳酸氫鉀

Common Synonyms: Potassium Acid Carbonate; Potassium Hydrogen Carbonate

Chemical Family: Potassium Compounds

Formula: KHCO_3

Formula Wt.: 100.12

CAS No.: 298-14-6

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: 100 deg. C (212 deg. F)
(@ 760 mmHg)
Specific Gravity: 2.17
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals, granules, or powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: None identified
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified

Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM BISULFATE****0239****PRODUCT INFORMATION**

Product Name: Potassium Bisulfate

Chinese Name: 硫(VI)酸氫鉀

Common Synonyms: Potassium Acid Sulfate; Potassium Hydrogen Sulfate

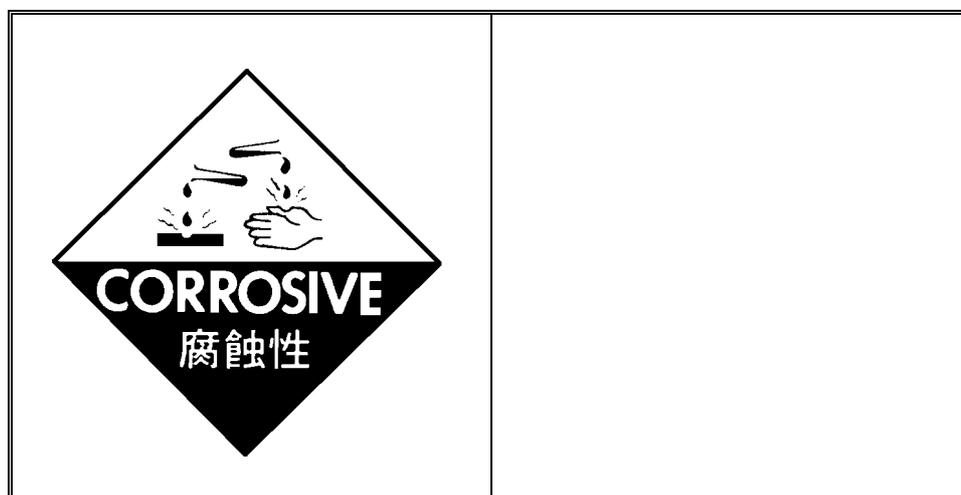
Chemical Family: Potassium Compounds

Formula: KHSO_4

Formula Wt.: 136.17

CAS No.: 7646-93-7

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: 197 deg. C (386 deg. F)
(@ 760 mmHg)
Specific Gravity: 2.24
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Sulfur dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles: None identified
Decomposition Products: Oxides of sulfur

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified

The above information is believed to be accurate to the best of our knowledge.
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Ingestion: None identified

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Potassium Bisulfate

2340 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Brain, gi tract, respiratory system, skin

Medical Conditions Generally Aggravated By Exposure: Asthma

Primary Routes Of Entry: Inhalation, skin contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM SULFATE****0240****PRODUCT INFORMATION**

Product Name: Potassium Sulfate

Chinese Name: 硫(VI)酸鉀

Common Synonyms: Sulfuric Acid, Dipotassium Salt

Chemical Family: Potassium Compounds

Formula: K_2SO_4

Formula Wt.: 174.27

CAS No.: 7778-80-5

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Skin Absorption: None identified
Ingestion: Nausea, vomiting
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Respiratory system, lungs
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:
If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:
In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:
None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS

PUMICE STONE

0242

PRODUCT INFORMATION

Product Name: Pumice Stone

Chinese Name: 浮石

RISK SYMBOL

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PHYSICAL DATA

Boiling Point: N/A

Vapor Pressure (mm Hg): N/A

Vapor Density (AIR-1): N/A

Solubility in Water: Nil

Specific Gravity (H₂O-1): 2.2

Melting Point: N/A

Evaporation Rate (Butyl Acetate-1): N/A
Appearance and Odor: Fine powder, grey in color, earthy odor.

FIRE AND EXPLOSION DATA

Flash Point (T.C.C.): Non-Flammable
Flammable Limits: LEL: N/A UEL: N/A
Extinguishing Media: N/A
Special Fire Fighting Procedures: N/A
Unusual Fire and Explosion Hazards: None known

REACTIVITY DATA

Stability Stable
Conditions to Avoid: N/A
Incompatibility (Materials to Avoid): N/A
Hazardous Decomposition or By-products: N/A
Polymerization Will Not Occur

HEALTH HAZARD DATA

Route (s) of Entry:
Eyes? N/A
Inhalation? N/A
Skin? N/A
Ingestion? N/A
Health Hazards: Avoid excessing dusting
Carcinogenicity: No
NTP? N/A IARC Monographs? N/A OSHA Regulated N/A
Signs and Symptoms of Exposure: N/A
Medical Conditions Aggravated by Exposure: N/A

FIRST AID MEASURES

In Eyes: N/A
If Breathed: N/A
If in Skin: N/A

If Swallowed: N/A

PREVENTATIVE MEASURES

Respiratory Protection (Specify Type): Particle mask.

Ventilation : Local Exhaust

Protective Gloves: N/A

Eye Protection: N/A

Other Protective Clothing or Equipment: N/A

Handling and Storing Precautions: N/A

Other Precautions: Do not get in eyes. Avoid breathing of vapors or dust. Keep out of reach of children.

ENVIRONMENTAL PROTECTION DATA

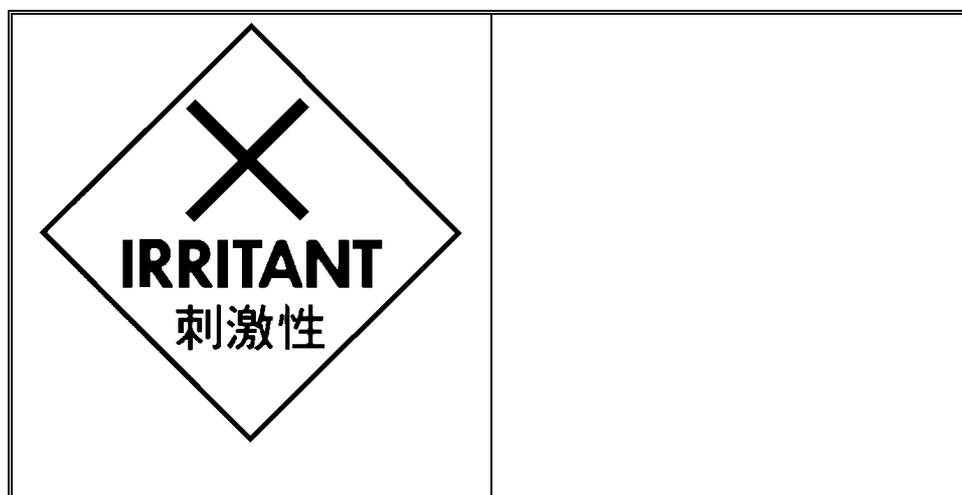
Steps to be Taken in Case Material is Released or Spilled: Sweep up as trash

Material Safety Data Sheet

City University of Hong Kong

MSDS SODIUM CARBONATE, ANHYDROUS 0245**PRODUCT INFORMATION**

Product Name: Sodium Carbonate, Anhydrous
Chinese Name: 碳酸鈉
Common Synonyms: Soda Ash; Disodium Carbonate
Chemical Family: Inorganic Sodium Compounds
Formula: Na_2CO_3
Formula Wt.: 105.99
CAS No.: 497-19-8
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: 851 deg. C (1563 deg. F)
(@ 760 mmHg)
Specific Gravity: 2.53
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White to gray crystals. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide, oxides

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Humidity
Incompatibles: Strong acids, aluminum, fluorine, oxides of phosphorus, lithium
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract, irritation of mucous membranes
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Ingestion:

Ingestion of large quantities may cause gastrointestinal irritation, nausea, vomiting, diarrhea

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Intraperitoneal Mouse LD₅₀ For Sodium Carbonate, Anhydrous

117 mg/kg

Inhalation-2hr Mouse LC₅₀ For Sodium Carbonate, Anhydrous

1200 mg/m³

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Chronic Effects: None identified

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM CHLORIDE****0246****PRODUCT INFORMATION**

Product Name: Sodium Chloride
Chinese Name: 氯化鈉
Common Synonyms: Salt; Rock Salt; Saline; Table Salt
Chemical Family: Inorganic Sodium Compounds
Formula: NaCl
Formula Wt.: 58.44
CAS No.: 7647-14-5
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: 1413 deg. C (2575 deg. F) Vapor Pressure (mmHg): <1
(@ 760 mmHg) (20 deg. C)
Melting Point: 801 deg. C (1473 deg. F) Vapor Density (Air=1): N/A
(@ 760 mmHg)
Specific Gravity: 2.16 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystalline solid. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Hydrogen chloride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: Strong oxidizing agents, lithium, inter-halogens (ex. bromine trifluoride), iron, cement
Decomposition Products: Hydrogen chloride

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation
Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Ingestion of large quantities may cause gastrointestinal irritation

Chronic Effects: High blood pressure, rapid ineffective breathing

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD ₅₀ For Sodium Chloride	3000 mg/kg
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Intraperitoneal Mouse LD ₅₀ For Sodium Chloride	2602 mg/kg
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Subcutaneous Mouse LD ₅₀ For Sodium Chloride	3150 mg/kg
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Intravenous Mouse LD ₅₀ For Sodium Chloride	645 mg/kg
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Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: Eyes, skin, respiratory system, mucous membranes

Medical Conditions Generally Aggravated By Exposure: High blood pressure

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS SODIUM CITRATE, DIHYDRATE 0247**PRODUCT INFORMATION**

Product Name: Sodium Citrate, Dihydrate

Chinese Name: 檸檬酸鈉

Common Synonyms: Trisodium Citrate

Chemical Family: Organic Sodium Salts

Formula: $\text{HOC}(\text{COONa})(\text{CH}_2\text{COONa})_2 \cdot 2\text{H}_2\text{O}$

Formula Wt.: 294.10

CAS No.: 6132-04-3

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals, granules, or powder. odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Flame
Incompatibles: None identified
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: None identified

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Intraperitoneal Rat LD₅₀ For Sodium Citrate, Dihydrate

1548 mg/kg

Intravenous Mouse LD₅₀ For Sodium Citrate, Dihydrate

170 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM BICARBONATE****0249****PRODUCT INFORMATION**

Product Name: Sodium Bicarbonate
Chinese Name: 重碳酸鈉
Common Synonyms: Baking Soda; Sodium Acid Carbonate
Chemical Family: Inorganic Sodium Compounds
Formula: NaHCO_3
Formula Wt.: 84.01
CAS No.: 144-55-8
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: 50 deg. C (122 deg. F)
(@ 760 mmHg)
Specific Gravity: 2.16
(H₂O=1)
Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
Solubility(H₂O): Moderate (1-10%)
% Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystalline powder. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, humidity
Incompatibles: None identified
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: Irritation
Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Sodium Bicarbonate

4220 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Skin contact, eye contact

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

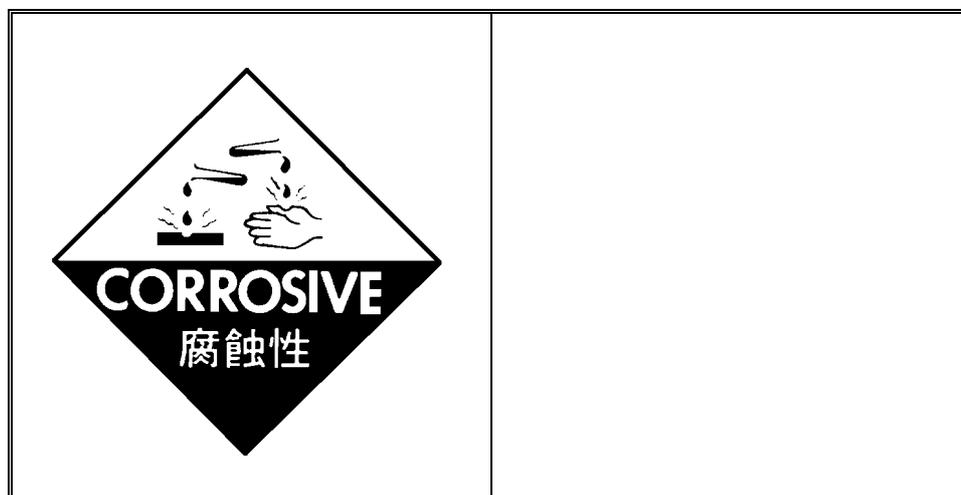
The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM BISULFATE****0250****PRODUCT INFORMATION**

Product Name: Sodium Bisulfate
Chinese Name: 重硫酸鈉
Common Synonyms: N/A
Chemical Family: Inorganic Sodium Compounds
Formula: $\text{NaHSO}_4 \cdot \text{H}_2\text{O}$
Formula Wt.: 138.07
CAS No.: 7681-38-1
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

City University of Hong Kong

The above information is believed to be accurate to the best of our knowledge.
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Boiling Point: N/A
Melting Point: 59 deg. C (138 deg. F)
(@ 760 mmHg)
Specific Gravity: 2.10
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals or powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Sulfur dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: Water
Decomposition Products: Oxides of sulfur

HEALTH HAZARD DATA

Inhalation: Irritation of upper respiratory tract
Skin Contact: Irritation
Eye Contact: Irritation
Skin Absorption: None identified
Ingestion: Headache, nausea, vomiting, dizziness, gastrointestinal irritation

Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM NITROPRUSSIDE****0252****PRODUCT INFORMATION**

Chemical Name : Sodium Nitroprusside
Chinese Name: 硝普鈉, 硝普化鈉
Synonyms : Sodium Nitroferricyanide
Chemical Family: Inorganic salt
Chemical Formula: $\text{Na}_2\text{Fe}(\text{CN})_5\text{NO}\cdot 2\text{H}_2\text{O}$
Product Use: Laboratory reagent
CAS No. : 14402-89-2

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

City University of Hong Kong

The above information is believed to be accurate to the best of our knowledge.
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Odour and Appearance: Red transparent crystals
Odour Threshold (ppm): Not available
Vapour Pressure (mm Hg): Not applicable
Vapour Density (Air=1): Not applicable
Evaporation Rate: Not applicable
Boiling Point (deg. C): Not applicable
Melting Point (deg. C): Not applicable
pH: Not available
Specific Gravity: 1.72
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Nonflammable
Extinguishing Media: CO₂, foam, dry chemical. Do not use water
Flash Point (Method Used): Not applicable
Autoignition Temperature: Not available
Upper Flammable Limit (% by volume): Not applicable
Lower Flammable Limit (% by volume): Not applicable
Hazardous Combustion Products: None found

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances: Oxidizers, nitrates
Reactivity: Moisture results in slow decomposition
Hazardous Decomposition Products:
Decomposes in fire. May cause release of cyanide fumes and nitrogen compounds.

HEALTH HAZARD DATA

LD₅₀: (oral, rabbit) 34 mg/kg
LC₅₀: Not available
Inhaled: Irritates. Toxic. Lowering of blood pressure, rapid pulse, headache, nausea, dizziness, death.
In contact with skin: Harmful
In contact with eyes: Irritates
Ingested: Toxic, see inhalation
Carcinogenicity: No information available
Teratogenicity: No information available
Reproductive Effects: No information available

Mutagenicity: No information available

Synergistic Products: None found

FIRST AID MEASURES

Eyes: Wash thoroughly with water. Get medical advice if irritation develops.

Skin:

Remove contaminated clothing. Wash skin with plenty of water for at least fifteen (15) minutes. If irritation develops seek medical attention.

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Rinse mouth thoroughly with water. Do not induce vomiting. Have victim drink 220-400 ml of water to dilute. Seek medical attention.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation recommended

Respiratory Protection: Dust mask or respirator

Eye Protection: Chemical safety goggles

Skin Protection: Plastic apron, sleeves, gloves and boots as appropriate

Other Personal Protective Equipment: Eye wash

Handling Procedures and Equipment: Follow routine safe handling procedures. Avoid generating dust.

Storage Requirements:

Store in suitable labelled containers. Keep containers tightly closed when not in use and when empty. Protect from damage. Store in a cool, dry, well-ventilated area, out of direct sunlight.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

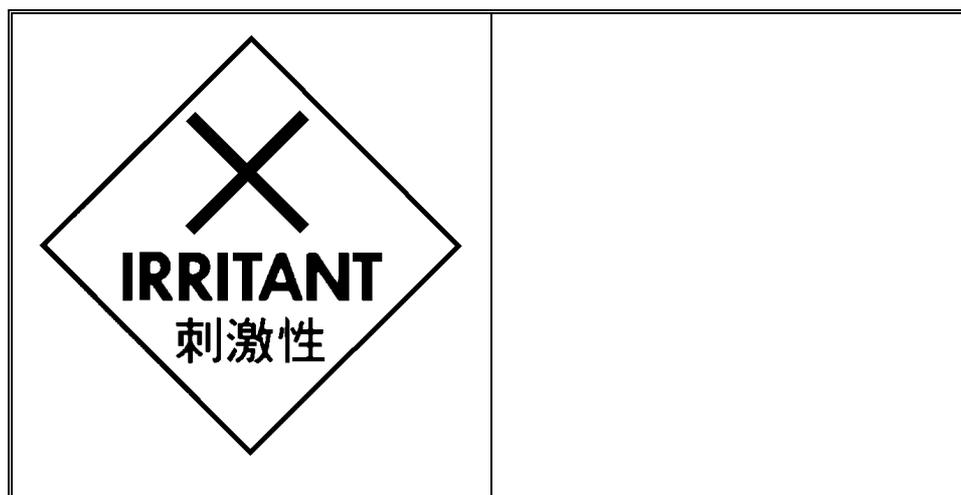
Transfer carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM SILICATE****0254****PRODUCT INFORMATION**

Trade Name(s): Sodium Silicate
Chinese Name: 硅酸鈉, 矽酸鈉
Chemical Name : Not Applicable
CAS/UN No: 1344-09-8

RISK SYMBOL**PHYSICAL DATA**

Boiling Point (C): 100 deg. C
% Volatile by Vol: Approx 60%
Bulk Dens./Spec. Grav: 1.4 g/cc
pH Level: 11

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Vapor Pressure: As for water
Coef. H₂O/Oil Dist.: Not available
Melting Point: 0 deg. C
Freezing Point : 0 deg. C
Molecular Weight: Not available
Odour Threshold Conc.: Not available
Vapor Density (Air=1): >1
Evaporation Rate: Water vs.: 1
Solubility in Water: Miscible
Appearance, Odour And Use : Water coloured viscous liquid, no odour. Binder for sand systems.

FIRE AND EXPLOSION DATA

Flash Point And Method: Not applicable
Auto-Ignition Temperature (C): Not applicable
Lower Explosion Limit: Not applicable
Upper Explosion Limit: Not applicable
Special Procedures :
Due to possibility of toxic fume if involved in fire, wear self contained breathing apparatus.

Hazardous Combustion Products : Na₂O fumes possible.

REACTIVITY DATA

Stability : Stable unless exposed to conditions or materials listed in this section.
Conditions: High temperatures (>1200 deg. C)
Incompatibility To Other Substances :
Strong Acids - Heat reaction may be violent.
Aluminum Metal - Sodium silicate solution may corrode aluminum containers.

Hazardous Decomposition Products : Heat, Na₂O fume possible.
Hazardous Polymerization Will Not Occur.
Conditions: Not applicable

HEALTH HAZARD DATA

Routes Of Entry :
Inhalation Acute? Yes Inhalation Chronic? Yes
Skin Contact? Yes Skin Absorption? No
Ingestion? Yes Eye Contact? Yes

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Additional Information :

Inhalation applicable only if mist generated during use.

Sodium silicate solutions are mildly caustic. Therefore treat as corrosive.

Carcinogenicity : NAP

Skin And Mucous Membrane Irritation Possible.

A Severe Eye Irritant.

Ingestion Will Result In Gastrointestinal Upset.

Chronic: Prolonged exposure may result in burns to exposed areas.

Signs And Symptoms Of Exposure : Nausea, vomiting, diarrhea.

FIRST AID MEASURES

Eyes: Flush with copious amounts of water; consult physician immediately.

Skin: Wash with soap and water. If irritation persists, consult physician.

Inhalation: Remove person to fresh air. Consult physician as soon as possible.

Ingestion: Do not induce vomiting. Guard against aspiration into lungs. Consult physician immediately.

PREVENTATIVE MEASURES

Respiratory Protection :

If mist generated, wear approved respirator e.g. willson respirator with t20 filter or equivalent.

Ventilation :

Local: Not applicable

Special: Not applicable

Mechanical: As required to maintain levels below the listed TLV's.

Precautions To Be Taken In Handling And Storing :

Store in a cool, dry area, away from acids. keep from freezing. replace cap/lid when not in use.

Clothing/Equipment :

Gloves: Rubber or PVC.

Eye: Chemical safety goggles or face shield.

Clothing/Equipment: Wear impervious clothing to prevent exposure of skin.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In Case Material Is Released Or Spilled : Absorb with sand or inert material.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**STARCH, SOLUBLE****0256**

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PRODUCT INFORMATION

Product Name: Starch, Soluble

Chinese Name: 澱粉

Common Synonyms: Amglogen; Amylodextrin

Chemical Family: Natural Products

Formula: $(C_6H_{10}O_5)_n$

Formula Wt.: N/A

CAS No.: 9005-84-9

Product Use: Laboratory Reagent

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RISK SYMBOL

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PHYSICAL DATA

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Physical State: Solid
Boiling Point: N/A
Melting Point: N/A
Specific Gravity: N/A
(H₂O=1)
Solubility(H₂O): Slight (0.1-1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White powder. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: Strong oxidizing agents
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Inhalation: None identified
Skin Contact: None identified
Eye Contact: None identified
Skin Absorption: None identified
Ingestion: None identified

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): 10 mg/m³
TLV Is For Nuisance Dusts And Particulates.
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): 15 mg/m³
PEL Is For Nuisance Dusts And Particulates.
Toxicity Of Components:
No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Eyes, Skin
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Eye contact, skin contact, inhalation

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact:

In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to ppm, a dust/mist respirator is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**STRONTIUM CHLORIDE****0257****PRODUCT INFORMATION**

Product Name: Strontium Chloride, 6-Hydrate

Chinese Name: 氯化鋇

Common Synonyms: N/A

Chemical Family: Strontium Compounds

Formula: $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$

Formula Wt.: 266.62

CAS No.: 10025-70-4

Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Skin Absorption: None identified
Ingestion: May be harmful
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: None identified
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Ingestion

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact: In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**STRONTIUM NITRATE****0258****PRODUCT INFORMATION**

Product Name: Strontium Nitrate
Chinese Name: 硝(V)酸鋇
Common Synonyms: Strontium (II) Nitrate
Chemical Family: Strontium Compounds
Formula: $\text{Sr}(\text{NO}_3)_2$
Formula Wt.: 211.63
CAS No.: 10042-76-9
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: N/A
Melting Point: 570 deg. C (1058 deg. F)
(@ 760 mmHg)
Specific Gravity: 2.99
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White green or purple odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): 7.30
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Closed containers exposed to heat may explode.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, shock
Incompatibles: Strong reducing agents, combustible materials, organic materials
Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Inhalation: None identified
 Skin Contact: Irritation
 Eye Contact: Irritation
 Skin Absorption: None identified
 Ingestion: None identified
 Chronic Effects: None identified
 Threshold Limit Value (TLV/TWA): Not established
 Short-Term Exposure Limit (STEL): Not established
 Permissible Exposure Limit (PEL): Not established
 Toxicity Of Components:
 Oral Rat LD₅₀ For Strontium Nitrate 2750 mg/kg
 Intraperitoneal Rat LD₅₀ For Strontium Nitrate 540 mg/kg
 Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
 Reproductive Effects: None identified.
 Target Organs: None identified
 Medical Conditions Generally Aggravated By Exposure: None identified
 Primary Routes Of Entry: Skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.
 Inhalation:
 If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Skin contact: in case of contact, flush skin with water.
 Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:
 Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, butyl rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials.

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ENVIRONMENTAL PROTECTION DATA
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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Keep combustibles (wood, paper, oil, etc.) Away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS STANNIC CHLORIDE, 5-HYDRATE 0260**PRODUCT INFORMATION**

Product Name: Stannic Chloride, 5-Hydrate

Chinese Name: 氯化錫(IV)

Common Synonyms: Tin (IV) Chloride, 5-Hydrate; Tin Perchloride, 5-Hydrate; Tin Tetrachloride

Chemical Family: Tin Compounds

Formula: $\text{SnCl}_4 \cdot 5\text{H}_2\text{O}$

Formula Wt.: 350.58

CAS No.: 10026-06-9

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

1

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Physical State: Solid
Boiling Point: 114 deg. C (237 deg. F)
(@ 760 mmHg) Vapor Pressure (mmHg): 30
(20 deg. C)
Melting Point: -33 deg. C (-27 deg. F)
(@ 760 mmHg) Vapor Density (Air=1): 9.0
Specific Gravity: 2.26 Evaporation Rate: N/A
(H₂O=1)
Solubility(H₂O): Appreciable (>10%) % Volatiles By Volume: 0
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White solid. Odorless.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use dry chemical or carbon dioxide. Do not use water.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move exposed containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool; do not get water inside containers.
Unusual Fire & Explosion Hazards: Closed containers exposed to heat may explode.
Toxic Gases Produced: Hydrogen chloride

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Moisture
Incompatibles: Water, strong reducing agents
Decomposition Products: Hydrogen chloride

HEALTH HAZARD DATA

Inhalation: Severe irritation of respiratory system
Skin Contact: Severe irritation or burns

Eye Contact: Severe irritation or burns
Skin Absorption: None identified
Ingestion: None identified
Chronic Effects: None identified
Threshold Limit Value (TLV/TWA): 2 mg/m³
TLV Is For Tin, Oxide And Inorganic Compounds, Except SnH₄, As Sn.
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): 2 mg/m³
PEL Is For Tin, Inorganic Compounds, Except Oxides, As Sn.
Toxicity Of Components:
Intraperitoneal Mouse LD₅₀ For Stannic Chloride, 5-Hydrate 41 mg/kg
Intravenous Mouse LD₅₀ For Stannic Chloride, 5-Hydrate 32 mg/kg
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.
Reproductive Effects: None identified.
Target Organs: Eyes, Skin, Respiratory System
Medical Conditions Generally Aggravated By Exposure: None identified
Primary Routes Of Entry: Inhalation, eye contact, skin contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, do not induce vomiting.
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.
Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 100 mg/m³, a high-efficiency particulate respirator is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements: Keep container tightly closed. Store in corrosion-proof area.

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ENVIRONMENTAL PROTECTION DATA

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Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS

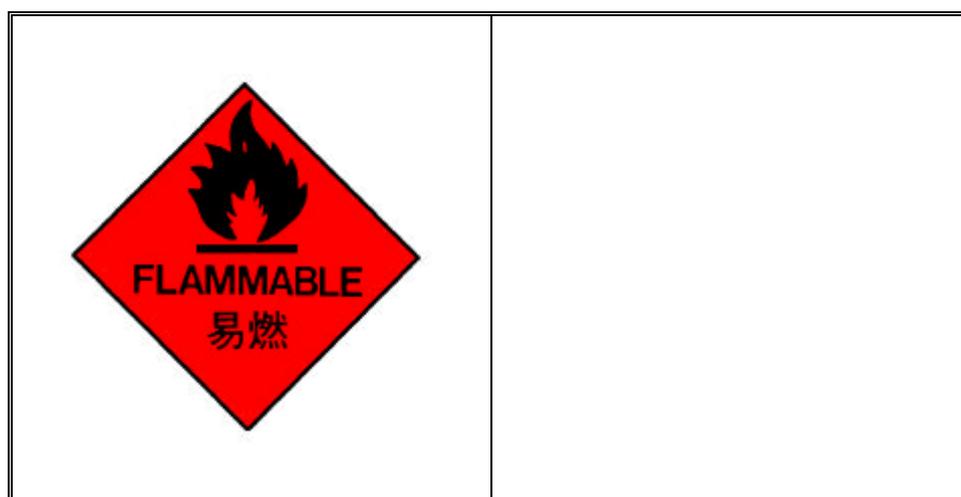
UNIVERSAL pH Indicator

0262

PRODUCT INFORMATION

Trade Name	UNIVERSAL pH Indicator
Chinese Name	通用指示劑
Form/Appearance	Dark Blue Odourless Liquid
Recommended Use	Test Kit Reagent

RISK SYMBOL



PHYSICAL DATA

pH (Conc)	100%=7	Boiling Point	100 deg. C
Freezing Point	0 deg. C	% Volatiles	99
Solubility in Water	Complete	Specific Gravity	1.0
Vapor Density	NA	Evaporation Rate	<1 (ether=1)

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FIRE AND EXPLOSION DATA

Flash Point None
Extinguishing Medium Product does not support combustion

REACTIVITY DATA

Stable YES
Hazardous Polymerization Will Not Occur
Hazardous Conditions to Avoid/Incompatibility:
Do not mix with other chemicals. Use only as specified by test kit instructions.

HEALTH HAZARD DATA

Effects of Overexposure
Skin and Eyes: May cause irritation
If Swallowed: May cause stomach distress, nausea or vomiting.

FIRST AID MEASURES

Eyes:
Flush immediately with plenty of cool running water. Remove contact lenses. Continue flushing for 15 minutes.

Skin: Flush skin with plenty of cooling running water. Wash thoroughly with soap and water.

If Swallowed:
Rinse mouth; then drink 1 or 2 large glasses of water. DO NOT induce vomiting. Never give anything by mouth to an unconscious person. If irritation or discomfort persists, call a physician

PREVENTATIVE MEASURES

Eye Protection : Not required
Protective Gloves : Not required. Product may stain skin
Ventilation : NA

Other Measures : Keep out of reach of children

ENVIRONMENTAL PROTECTION DATA

Spill Response : Wipe up or flush to sewer

Material Safety Data Sheet

City University of Hong Kong

MSDS**ZINC CARBONATE****0263****PRODUCT INFORMATION**

Product Name: Zinc Carbonate
Chinese Name: 碳酸鋅
Common Synonyms: Carbonic Acid, Zinc Salt
Chemical Family: Zinc Compounds
Formula: N/A
Formula Wt.: N/A
CAS No.: 3486-35-9
Product Use: Laboratory Reagent

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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Boiling Point: N/A
Melting Point: N/A
Specific Gravity: 4.40
(H₂O=1)
Solubility(H₂O): Negligible (<0.1%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White powder.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): N/A
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)
Physical State: Solid

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.
Unusual Fire & Explosion Hazards: None identified.
Toxic Gases Produced: Carbon monoxide, carbon dioxide, zinc fumes

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: None documented
Incompatibles: Strong acids
Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established
Short-Term Exposure Limit (STEL): Not established
Permissible Exposure Limit (PEL): Not established
Toxicity Of Components: No information is available
Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation: None identified

Skin Contact: None identified

Eye Contact: None identified

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: None indicated

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact: In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, proper gloves are recommended.

Storage Requirements: Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**ZINC CHLORIDE****0264****PRODUCT INFORMATION**

Product Name: Zinc Chloride

Chinese Name: 氯化鋅

Common Synonyms: Zinc Dichloride; Butter Of Zinc

Chemical Family: Zinc Compounds

Formula: ZnCl_2

Formula Wt.: 136.30

CAS No.: 7646-85-7

Product Use: Laboratory Reagent

RISK SYMBOL

City University of Hong Kong

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HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 1 mg/m³

TLV Is For Zinc Chloride Fume.

Short-Term Exposure Limit (STEL): 2 mg/m³

STEL Is For Zinc Chloride Fume.

Permissible Exposure Limit (PEL): 1 mg/m³

PEL Is For Zinc Chloride Fume.

Toxicity Of Components:

Oral Rat LD₅₀ For Zinc Chloride 350 mg/kg

Oral Mouse LD₅₀ For Zinc Chloride 350 mg/kg

Intraperitoneal Mouse LD₅₀ For Zinc Chloride 31 mg/kg

Subcutaneous Mouse LD₅₀ For Zinc Chloride 330 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects:

Tests on laboratory animals indicate material may be mutagenic and embryotoxic.

Effects Of Overexposure:

Inhalation: Headache, coughing, difficult breathing, chest pains, severe lung irritation, pulmonary edema

Skin Contact: Severe irritation or burns

Eye Contact: Severe irritation or burns

Skin Absorption: None identified

Ingestion: Nausea, vomiting, gastrointestinal irritation, burns to mouth and throat

Chronic Effects: Damage to liver, kidneys, lungs

Target Organs: Respiratory system, lungs, eyes, skin, gi tract, liver, kidneys

Medical Conditions Generally Aggravated By Exposure: Lung disease

Primary Routes Of Entry: Inhalation, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation :

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Skin Contact :

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact : In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation : Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection :

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 9 ppm, a high-efficiency particulate respirator is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection : Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements :

Keep container tightly closed. Store in corrosion-proof area. Isolate from incompatible materials.

Special Precautions : Material is hygroscopic.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge :

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ZINC DUST****0265****PRODUCT INFORMATION**

Product Name: Zinc Dust
Chinese Name: 鋅粉
Common Name/Synonym: None
CAS Registry Number: 7440-66-6
Chemical Name: Zinc Dust
Chemical Family: Metal/Metal Oxide
Formula: Zn
Molecular Weight: N/AP
Product Use: General uses.

RISK SYMBOL

PHYSICAL DATA

Boiling Point: 906 deg. C
Melting Point: N/D
Freezing Point: N/AP
Specific Gravity (Water=1): 7.1
Vapour Pressure (mmHg): N/AP
Vapour Density: N/AP
pH: N/AP
Solubility in Water: Insoluble
% Volatile: N/AP
Evaporation Rate (Butyl Acetate=1): N/AP
Odour Threshold: N/AP
Coefficient of Water/Oil Distribution: N/D
Appearance and Odour: Grey dust/powder
Physical State: Solid

FIRE AND EXPLOSION DATA

Flash Point/Method: N/AP
Lower Explosion Limit (% by volume): Zinc dust 480 g/m³
Upper Explosion Limit: N/AP
Autoignition Temperature: 600 deg. C
Extinguishing Media: Class D extinguisher. Dry powder type. Avoid water.
Special Fire Fighting Procedures:
Use approved self-contained breathing apparatus and full protective clothing if fighting fire.

Unusual Fire and Explosion Hazards: N/D
Hazardous Combustion Products: Zinc oxide fume.
Explosion Data :
Sensitivity to Mechanical Impact: N/AP
Sensitivity to Static Discharge: Yes
Explosive Power: N/D

Rate of Burning: N/AP
Flammability: Yes
Conditions of Flammability:
Finely divided zinc dust may form explosive mixtures with air if ignited. Contact with acids or alkaline hydroxides may evolve hydrogen.

REACTIVITY DATA

Stability: Yes

Hazardous Polymerization: N/D

Conditions to Avoid: Avoid moisture or high humidity.

Materials to Avoid:

Halogen gases, acids, bases, oxidizers may react violently or cause hydrogen to be evolved.

Hazardous Decomposition Products: Heat generates zinc oxide fume.

Conditions of Reactivity:

Bulk dust in damp state may heat spontaneously and ignite on exposure to air. Contact with acids or alkaline hydroxides may evolve explosive hydrogen gas. Forms zinc oxide when heated.

HEALTH HAZARD DATA

LD₅₀ Oral (rat): N/D

LD₅₀ Dermal (rabbit): N/D

LC₅₀ (species): N/D

Carcinogenicity: Does not meet WHMIS criteria.

Sensitization: None reported.

Irritancy: Mechanical irritant to eyes and skin.

Reproductive Effects: Does not meet WHMIS criteria.

Teratogenicity: Does not meet WHMIS criteria.

Mutagenicity: Does not meet WHMIS criteria.

Toxicologically Synergistic Products: None reported.

Other Data: N/D

Environmental Effects: N/D

Primary Routes of Exposure: Skin, eye, inhalation.

Signs, Symptoms and Effects of Exposure

Inhalation: When zinc fumes are inhaled they may cause flu-like symptoms or fever, chills and nausea.

Eye Contact: May irritate.

Skin Contact: May irritate.

Ingestion: May cause fever, stomach cramps and diarrhea.

Chronic Effects of Exposure: N/D

Medical Conditions Aggravated by Exposure: N/D

Additional Information: N/D

FIRST AID MEASURES

If Inhaled : Consult physician immediately.

In Case of Eye Contact :

Flush eyes with lukewarm gently running water. If irritation persists, consult physician.

In Case of Skin Contact : Wash thoroughly with soap and water.

If Ingested : Consult physician immediately.

General Advice : Seek medical advice except for minor instances of eye or skin exposure.

PREVENTATIVE MEASURES

Ventilation (Engineering Controls): Keep dust levels low.

Personal Protective Equipment - Respiratory and eye protection.

Respiratory: NIOSH/MSHA; Dust/Fume.

Eye: Safety glasses.

Clothing: N/AP

Other Protective Measures: None

Storage and Handling Precautions and Equipment:

Keep in dry, cool, well-ventilated area away from heat. Keep dust levels low. Avoid moisture.

ENVIRONMENTAL PROTECTION DATA

Action to Take for Spills or Leaks: Restrict access to clean-up personnel. Ventilate area well.

Material Safety Data Sheet

City University of Hong Kong

MSDS

ZINC, GRANULAR

0266

PRODUCT INFORMATION

Chemical Name and Synonyms: Zinc, Granular, No. 20 Mesh

Chinese Name: 鋅

Chemical Family: Metal

Chemical Formula: Zn

Product Use: Laboratory Solvent

CAS No.: 7440-66-6

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Odour and Appearance: Bluish-gray metal in different forms; odourless

Odour Threshold (ppm): Not applicable
Vapour Pressure (mmHg): 1 mmHg at 487 deg. C
Vapour Density (Air=1): Not applicable
Evaporation Rate: Not applicable
Boiling Point (deg. C): 908 deg. C
Melting Point (deg. C): 419.5 deg. C
pH: Not available
Specific Gravity: 7.140
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Powder form is flammable under almost all ambient conditions.

Extinguishing Media:

USE ONLY dry powder or sand (for powder). Avoid water since contact will cause the liberation of highly flammable gases.

Flash Point (Method Used): Not available

Autoignition Temperature: Not available

Upper Flammable Limit (% by volume): Not available

Lower Flammable Limit (% by volume): Not available

Hazardous Combustion Products: None

Sensitivity to Impact: None

Sensitivity to Static discharge: May be ignited by static discharge

REACTIVITY DATA

Chemical Stability:

Stable in dry air. Becomes covered with a white coating of basic carbonate on exposure to moist air.

Incompatibility with other substances:

Water, acids, oxidizers, halogenated hydrocarbons, strong alkalies, alkali hydroxides

Reactivity:

Powder may ignite spontaneously with air, especially when damp. Powder forms explosive mixtures with air and may explode if ignited by flame.

Hazardous Decomposition Products: Explosive hydrogen gas, ZnO

HEALTH HAZARD DATA

LD₅₀: Not available

LC₅₀: Not available

Inhaled:

Inhalation of fumes may result in sweet taste, throat dryness, cough, weakness, generalized aching, chills, fever, nausea and vomiting.

In Contact With Skin: Causes irritation

In Contact With Eyes: Physical irritation

Ingested: Harmful/toxic. May cause severe gastroenteritis.

Carcinogenicity: No

Teratogenicity: No information available

Reproductive Effects: No information available

Mutagenicity: No information available

Synergistic Products: None known

FIRST AID MEASURES

Specific Measures :

Eyes : Wash thoroughly with water. Get medical advice if irritation develops.

Skin:

Remove contaminated clothing. Wash skin with plenty of water for at least fifteen (15) minutes. If irritation develops seek medical attention.

Inhalation : Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Rinse mouth thoroughly with water. Do not induce vomiting. Have victim drink 220-400 ml of water to dilute. Seek medical attention.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust recommended

Respiratory Protection: Dust masks

Eye Protection: Chemical safety goggles

Skin Protection: Wear protective gloves and clean body-covering clothing.

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures and Equipment:

Follow routine safe handling procedures. Avoid generating dust. Wash thoroughly after handling. Use non-sparking tools.

Storage Requirements:

Store in suitable labelled containers. Keep containers tightly closed when not in use and when empty. Protect from damage. Store in a cool, dry, well-ventilated area, out of direct sunlight. Store away from incompatible materials. Store away from ignition sources. Air and moisture sensitive.

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ENVIRONMENTAL PROTECTION DATA
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Leak and Spill Procedure:

Mix with sand, transfer carefully into container and arrange removal by a disposal company. Wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ZINC NITRATE****0267****PRODUCT INFORMATION**

Product Name: Zinc Nitrate
Chinese Name: 硝(V)酸鋅
Common Synonyms: Nitric Acid, Zinc Salt, Hydrated Form
Chemical Family: Zinc Compounds
Formula: $\text{Zn}(\text{NO}_3)_2 \cdot n\text{H}_2\text{O}$
Formula Wt.: N/A
CAS No.: 10196-18-6
Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

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Boiling Point: N/A
Melting Point: 36 deg. C (96 deg. F)
(@ 760 mmHg)
Specific Gravity: 2.07
(H₂O=1)
Solubility(H₂O): Appreciable (>10%)
pH: N/A
Odor Threshold (ppm): N/A
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: White crystals. Odorless.

Vapor Pressure (mmHg): N/A
Vapor Density (Air=1): 8.4
Evaporation Rate: N/A
% Volatiles By Volume: 0
(21 deg. C)
Physical State: Solid

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): N/A
Autoignition Temperature: N/A
Flammable Limits: Upper - N/A Lower - N/A
Fire Extinguishing Media: Use water spray.
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards:
Can react violently with shock, friction or heat. Strong oxidizer. contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion.

Toxic Gases Produced: Oxides of nitrogen

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, shock
Incompatibles:
Strong reducing agents, combustible materials, organic materials, strong acids, strong bases

Decomposition Products: Oxides of nitrogen

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not established

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): Not established

Toxicity Of Components:

Oral Rat LD₅₀ For Zinc Nitrate, 6-Hydrate

1190 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation: Irritation of upper respiratory tract

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Nausea, vomiting

Chronic Effects: None identified

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, ingestion, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call a physician. If swallowed, if conscious, immediately induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Skin contact: in case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, uniform, proper gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store separately and away from flammable and combustible materials. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Keep combustibles (wood, paper, oil, etc.) away from spilled material. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**AMYL ACETATE****0272****PRODUCT INFORMATION**

Chemical Name and Synonyms: Amyl Acetate, pentyl acetate

Chinese Name: 醋酸戊酯

Chemical Family: Acid ester

Chemical Formula: $\text{CH}_3\text{COOC}_5\text{H}_{11}$

Product Use: Laboratory Reagent

CAS No.: 628-63-7

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Odour and Appearance: Colourless liquid with a pear-like odour

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Odour Threshold (ppm): 0.0265 mg/m³
Vapour Pressure (mm Hg): 4.5 mm Hg @ 20 deg. C
Vapour Density (Air=1): 4.49
Evaporation Rate: Not available
Boiling Point (deg. C): 128 deg. C
Freezing Point (deg. C): 23 deg. C
pH: Not available
Specific Gravity: 0.866
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Readily ignited in almost all ambient conditions
Extinguishing Media: Dry powder, CO₂
Flash Point (Method Used): 23 deg. C / cc
Autoignition Temperature: 380 deg. C
Upper Flammable Limit (% by volume): 1.1%
Lower Flammable Limit (% by volume): 7.5%
Hazardous Combustion Products: CO, CO₂
Sensitivity to Impact: None
Sensitivity to Static discharge: May be ignited by static discharge

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances: Strong oxidizing agents, strong bases
Reactivity: Heat, sparks, open flame
Hazardous Decomposition Products: CO, CO₂

HEALTH HAZARD DATA

Toxicological Data:
LD₅₀: (oral, rat) 6500 mg/kg
LC₅₀: Not available

Inhaled: Irritating to mucous membranes. Narcotic.
In contact with skin: May cause irritation. Assumed harmful if absorbed.
In contact with eyes: May cause irritation, burning, lacrimation.
Ingested:

Assumed harmful. May cause burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Carcinogenicity: No information available

Teratogenicity: No information available

Reproductive Effects: No information available

Mutagenicity: No information available

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

IMMEDIATELY FLUSH EYES with warm running water for a minimum of fifteen (15) minutes. (Using any available clean container, pour water in a gently Steady stream over the eye(s). Position casualty on back, face tilted to One side). HOLD eyelids open while flushing. REPEAT flushing if Irritation persists. Obtain MEDICAL ADVICE immediately. (Flushing may be Continued while casualty is transported to medical facility).

Skin:

IMMEDIATELY FLUSH exposed area with large amounts of warm running water WHILE REMOVING contaminated clothing (including rings, watches and shoes). CONTINUE flushing the area up to twenty (20) minutes. If irritation Persists, REPEAT FLUSHING. Obtain MEDICAL ADVICE immediately.

Inhalation:

IMMEDIATELY remove casualty from contaminated area to fresh air.
(CAUTION must be used by rescuers to avoid exposure to contaminating fumes.)

If BREATHING HAS STOPPED give artificial respiration. If BREATHING and PULSE ARE ABSENT, give CPR. IMMEDIATELY OBTAIN MEDICAL ATTENTION. Stay With casualty until medical assistance is reached.

Ingestion:

Do not induce vomiting. Danger of aspiration with emesis. If casualty is alert and not convulsing, rinse out mouth with water. Give up to 4 to 8 glasses of water to dilute material. Immediately get medical attention. If spontaneous vomiting occurs have casualty lean forward with head down to avoid breathing in of vomitus.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation recommended

Respiratory Protection: Self-contained breathing apparatus

Eye Protection: Goggles or face shield

Skin Protection: Plastic apron, sleeves and boots as appropriate. Nitrile gloves.

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures and Equipment:

Use approved flammable liquid storage containers in the work area. Ground Drums and bond transfer containers. Use non-sparking tools. Keep material away from sparks, flames and other Ignition sources. Post "No Smoking" signs in area of use. Keep away from Materials which can burn. Follow routine safe handling procedures.

Storage Requirements:

Store in suitable labelled containers. Keep containers tightly closed when Not in use and when empty.

Protect from damage. Store in a cool, dry, Well-ventilated area, out of direct sunlight.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Absorb on inert absorbent, transfer to container and arrange removal by Disposals company. Wash site of spillage thoroughly with water and Detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BUTYL ACETATE NORMAL****0279**

PRODUCT INFORMATION

Product Name: Butyl Acetate Normal

Chinese Name: 醋酸丁酯

Common Name/Synonym: Acetic acid; butyl ester; butyl ethanoate

CAS Registry Number: 123-86-4

Chemical Name: n-Butyl acetate

Chemical Family: Esters

Formula: $\text{CH}_3\text{COOC}_4\text{H}_9$

Molecular Weight: 116.16

Product Use: Solvent used in paints and coating products.

RISK SYMBOL



PHYSICAL DATA

Boiling Point: 126 deg. C at 760 mm Hg
Melting Point: N/D
Freezing Point: -73.5 deg. C
Specific Gravity (Water=1): 0.8826 at 20/20 deg. C
Vapour Pressure (20C): 8 mm Hg
Vapour Density (Air=1): 4.0
pH: N/D
Solubility in Water (% by weight): 0.68 at 20 deg. C
% Volatile by Volume: 100
Evaporation Rate (Butyl Acetate=1): 1
Odour Threshold: N/D
Coefficient of Water/Oil Distribution: N/D
Appearance and Odour: Water-white liquid; nonresidual odour.
Physical State: Liquid.

FIRE AND EXPLOSION DATA

Flash Point/Method: 26 deg. C, Tag closed cup, ASTM D 56
32 deg. C, Tag open cup, ASTM D 1310
Lower Flammable Limit: 1.7 (% by volume)
Upper Flammable Limit: 7.6 (% by volume)
Autoignition Temperature: N/D

Extinguishing Media:

Use alcohol-type or all-purpose-type foam by manufacturers' recommended techniques for large fires.
Use carbon dioxide or dry chemical media for small fires.

Special Fire Fighting Procedures:

Use self-contained breathing apparatus and protective clothing. Use water Spray to cool fire-exposed containers and structures.

Unusual Fire and Explosion Hazards:

Vapours formed from the product may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges, or other ignition sources at locations distant from product handling point. This material may produce a floating fire hazard.

Hazardous Combustion Products: N/D

Conditions of Flammability: N/D

REACTIVITY DATA

Stability: Stable.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: None currently known.

Materials to Avoid:

Alkali metal hydroxides, such as sodium hydroxide; strong oxidizing agents, Such as concentrated nitric acid.

Hazardous Decomposition Products:

Burning may produce carbon monoxide and/or carbon dioxide. Carbon monoxide Is highly toxic if inhaled; carbon dioxide in sufficient concentrations can Act as an asphyxiant.

Conditions of Reactivity: None currently known.

HEALTH HAZARD DATA

LD₅₀ Oral (rat): 13.1 g/kg, RTECS (1990)

LD₅₀ Dermal (rabbit): > 18 g/kg, Union Carbide

LC₅₀ (rat): 2000 ppm/4h, RTECS (1990)

Carcinogenicity: N/D

Sensitization: N/D

Irritancy: N/D

Reproductive Effects: N/D

Teratogenicity:

Foetotoxicity was observed in rats exposed to high concentrations of butyl Acetate (1500 ppm) and then only in the presence of maternal toxicity. No Foetotoxic effects were seen in rabbits under similar exposure conditions.

Mutagenicity: N/D

Toxicologically Synergistic Products: N/D

Environmental Effects: Highly toxic to aquatic life.

Primary Routes of Exposure: Inhalation, skin and eye contact, ingestion.

Signs, Symptoms and Effects of Exposure

Inhalation:

Vapour resulting from evaporation is irritating and may cause a burning sensation in the eyes, accompanied by excess tear formation; irritation of the nose and throat, with coughing and excess formation of phlegm, and possibly nausea and vomiting. In addition, high concentrations may cause sleepiness, drowsiness, slurred speech, incoordination, headache, and possibly unconsciousness.

Eye Contact:

Mild to moderately irritating. Immediate stinging and pain with reddening and possible swelling of the conjunctiva, excess tear formation, and blinking.

Skin Contact:

Brief contact is unlikely to cause any adverse reaction. Prolonged contact may cause moderate to moderately severe irritation, seen as reddening and swelling with possible burns, cracking, and fissuring of skin at site of contact.

Skin Absorption: No evidence of adverse effects from available information.

Ingestion:

Slightly toxic. Swallowing a large volume of liquid could result in dizziness, drowsiness, unconsciousness, breathing difficulties, and death. Smaller volumes could cause nausea, vomiting, diarrhea, abdominal discomfort, and headache.

Chronic Effects of Exposure: N/D

Medical Conditions Aggravated by Exposure:

Because of its defatting properties, this material may aggravate an existing dermatitis.

Additional Information:

Breathing air containing butyl acetate, which results from its use in Aerosol applications, may cause delayed lung injury.

FIRST AID MEASURES

If Inhaled:

Remove to fresh air. Give artificial respiration if not breathing. Oxygen may be given by qualified personnel if breathing is difficult. Call a physician.

In Case of Eye Contact:

Flush with water for at least 15 minutes. Call a physician if pain or visual disturbances persist.

In Case of Skin Contact:

Remove contaminated clothing and wash skin with plenty of soap and water. Wash clothing before reuse.

If Ingested:

If conscious, give 2 glasses of water and induce vomiting. Administer artificial respiration if not breathing. Call a physician if signs and symptoms of toxicity persist.

Notes to Physician:

Individuals experiencing breathing difficulties after exposure to vapours generated in aerosol applications should be observed for at least 48 hours in case delayed respiratory complications develop. There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

PREVENTATIVE MEASURES

Ventilation (Engineering Controls):

This product should be confined within closed equipment, in which case general (mechanical) room ventilation should be satisfactory. Special local ventilation may be needed at points where vapours can be expected to escape to the workplace air.

Personal Protective Equipment:

Respiratory:

NIOSH or MSHA approved self-contained breathing apparatus in high vapour concentrations.

Eye: Monogoggles.

Clothing: N/D

Footwear: N/D

Hands: Rubber gloves.

Other Protective Measures: Eye bath and safety shower.

Storage and Handling Precautions and Equipment:

Warning! Flammable. Harmful if inhaled. Causes eye irritation. Breathing aerosols may cause lung damage.

Keep away from heat, sparks, and flame. Avoid breathing vapour. Avoid contact with eyes. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

Special Shipping Information: N/D

Other Precautions:

Process hazard: sudden release of hot organic chemical vapours or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions.

Any use of this product in elevated-temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions. Further information is available in a technical bulletin entitled "Ignition Hazards of Organic Chemical Vapours".

ENVIRONMENTAL PROTECTION DATA

Action to Take for Spills or Leaks:

Extinguish and do not turn on any ignition source until area is determined to be free from explosion or fire hazards. Collect large spills for disposal. Flush small spills with water. This product has fairly low solubility in water; if the solubility limit is exceeded (as in a large spill), it will float on the surface. Also, it is highly toxic to aquatic life. Avoid discharge of butyl acetate to sewers or waterways.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BUTYLAMINE****0280**

PRODUCT INFORMATION

Product Name: Butylamine

Chinese Name: 丁<基>胺

Common Synonyms: N-Butylamine; 1-Aminobutane

Chemical Family: Amines

Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$

Formula Wt.: 73.14

CAS No.: 109-73-9

Product Use: Laboratory Reagent

RISK SYMBOL



PHYSICAL DATA

Boiling Point: 77 deg. C (170 deg. F)
(@ 760 mmHg) Vapor Pressure (mmHg): 82
(20 deg. C)
Melting Point: -50 deg. C (-58 deg. F) Vapor Density (Air=1): 2.5
(@ 760 mmHg)
Specific Gravity: 0.74 Evaporation Rate: 7.3
(H₂O=1) (Butyl Acetate = 1)
Solubility(H₂O): Complete (100%) % Volatiles By Volume: 100
(21 deg. C)
pH: N/A
Odor Threshold (ppm): N/A Physical State: Liquid
Coefficient Water/Oil Distribution: N/A
Appearance & Odor: Colorless liquid. Amine-like odor.

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): -12 deg. C (10 deg. F)
Autoignition Temperature: 311 deg. C (594 deg. F)
Flammable Limits: Upper - 9.8 % Lower - 1.7 %
Fire Extinguishing Media: Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective.)
Special Fire-Fighting Procedures:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.
Unusual Fire & Explosion Hazards:
Vapors may flow along surfaces to distant ignition sources and flash back. closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire.
Toxic Gases Produced: Oxides of nitrogen, carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Will not occur
Conditions To Avoid: Heat, flame, other sources of ignition
Incompatibles: Strong oxidizing agents, strong acids
Decomposition Products: Oxides of nitrogen, carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 15 mg/m (5 ppm)

TLV (Skin) Listed Denotes Ceiling Limit.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 15 mg/m (5 ppm)

Toxicity Of Components:

Oral Rat LD₅₀ For Butylamine 366 mg/kg

Skin Rabbit LD₅₀ For Butylamine 850 mg/kg

Inhalation-2hr Mouse LC₅₀ For Butylamine 800 mg/m

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation:

Severe irritation of respiratory system, coughing, difficult breathing, chest pains, pulmonary edema, unconsciousness

Skin Contact: Severe irritation or burns

Eye Contact: Severe irritation or burns

Skin Absorption: Rapid absorption

Ingestion: Nausea, vomiting, gastrointestinal irritation, burns to mouth and throat

Chronic Effects: None identified

Target Organs: Respiratory system, skin, eyes, mucous membranes

Medical Conditions Generally Aggravated By Exposure:

Skin disorders, eye disorders, respiratory system disease

Primary Routes Of Entry: Inhalation, absorption, ingestion, eye contact, skin contact

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give large amounts of water.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 250 ppm, a chemical cartridge respirator with ammonia/amine cartridge is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements:

Keep container tightly closed. Store in a cool, dry, well-ventilated, flammable liquid storage area.

Special Precautions: Bond and ground containers when transferring liquid.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources; no flares, smoking or flames in area. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS DIMETHYLAMINE (26% W/V IN H₂O) 0291**PRODUCT INFORMATION**Product Name: Dimethylamine (26% W/V In H₂O)

Chinese Name: 二甲<基>胺

Common Synonyms: N/A

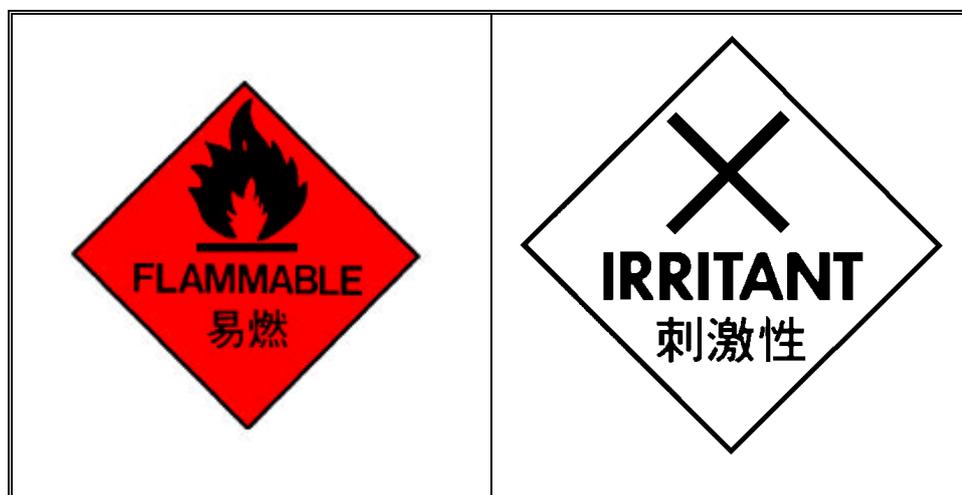
Chemical Family: Amines

Formula: (CH₃)₂NH

Formula Wt.: 45.09

CAS No.: 124-40-3

Product Use: Laboratory Reagent

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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Toxicity Of Components:

Intraperitoneal Mouse LD₅₀ For Water 190 g/kg

Intravenous Mouse LD₅₀ For Water 25 g/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity: None identified.

Reproductive Effects: None identified.

Effects Of Overexposure:

Inhalation: Irritation of respiratory system, pulmonary edema

Skin Contact: Burns

Eye Contact: Burns, corneal damage

Skin Absorption: None identified

Ingestion: Burns to mouth, throat, and stomach

Chronic Effects: None identified

Target Organs: Eyes, skin, mucous membranes, respiratory system, lungs

Medical Conditions Generally Aggravated By Exposure: Damaged skin, respiratory system disease

Primary Routes Of Entry: Skin contact, eye contact, inhalation, ingestion

FIRST AID MEASURES

Ingestion:

Call a physician. If swallowed, do not induce vomiting. If conscious, give water, milk, or milk of magnesia.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Good general ventilation* should be sufficient. Supplementary ventilation or respiratory protection may be needed in special circumstances. *typically 10 room volumes per hour is considered good general ventilation: ventilation rates should be matched to conditions of use.

Respiratory Protection:

If engineering controls are inadequate to control vapor concentrations to an acceptable level, a NIOSH approved vapor respirator should be worn if needed. If respirators are used, a program should be instituted to assure compliance with OSHA standard 29 CFR 1910.134.

Eye/Skin Protection: Wear goggles or face shield impervious gloves, boots and clothing should be worn

Storage Requirements: Keep from contact with oxidizing materials.

Special Precautions: Keep from contact with oxidizing materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Remove all sources of ignition. Absorb material in sand or other suitable absorbent and place in container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ETHYLENE GLYCOL****0305****PRODUCT INFORMATION**

Product Name: Ethylene Glycol

Chinese Name: 乙二醇

Common Synonyms: 1,2-Ethanediol; EG; Glycol; 1,2-Dihydroxyethane

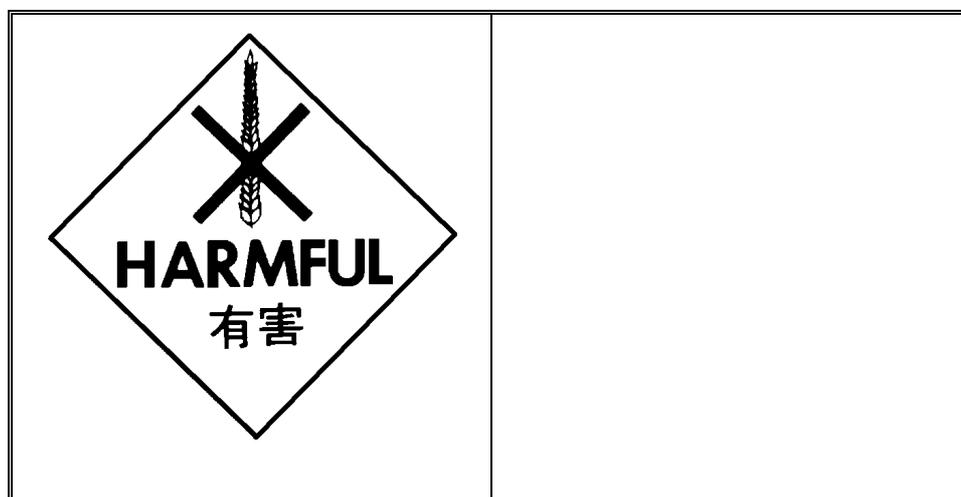
Chemical Family: Alcohols

Formula: $\text{HOCH}_2\text{CH}_2\text{OH}$

Formula Wt.: 62.07

CAS No.: 107-21-1

Product Use: Laboratory Reagent

RISK SYMBOL

City University of Hong Kong

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PHYSICAL DATA

Boiling Point: 197 °C (386 °F)
(At 760 mmHg)

Melting Point: -13 °C (8 °F)
(At 760 mmHg)

Specific Gravity: 1.12
(H₂O=1)

Solubility(H₂O): Complete (100%)

Vapor Pressure (mmHg): 0.06
(20 °C)

Vapor Density (Air=1): 2.1

Evaporation Rate: 0.01
(Butyl Acetate = 1)

% Volatiles By Volume: 100
(21°C)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: Colorless viscous liquid. Light odor.

Physical State: Liquid

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 111 °C (232 °F)

Autoignition Temperature: N/A

Flammable Limits: Upper - 15.3 % Lower - 3.2 %

Fire Extinguishing Media : Use water spray, alcohol foam, dry chemical or carbon dioxide.

Special Fire-Fighting Procedures:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards : None identified.

Toxic Gases Produced : Carbon monoxide, carbon dioxide

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: Heat, flame, other sources of ignition

Incompatibles:

Strong oxidizing agents, strong acids, polymerization catalysts & accelerators, sulfuric acid, nitric acid

Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Effects Of Overexposure :**Inhalation:**

Headache, nausea, vomiting, dizziness, drowsiness, irritation of upper respiratory tract, unconsciousness.

Skin Contact: Irritation**Eye Contact: Irritation****Skin Absorption: May be harmful****Ingestion:**

Headache, nausea, vomiting, dizziness, gastrointestinal irritation, convulsions, respiratory failure, central nervous system depression, unconsciousness, and may be fatal.

Chronic Effects: Damage to liver, kidneys, lungs, blood, central nervous system.

Threshold Limit Value (TLV/TWA): 125 mg/m (50 ppm)

Tlv Listed Denotes Ceiling Limit.

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 125 mg/m (50 ppm)

PEL Listed Denotes Ceiling Limit.

Toxicity Of Components :

Oral Rat LD₅₀ For Ethylene Glycol 4700 mg/kg

Intraperitoneal Rat LD₅₀ For Ethylene Glycol 5010 mg/kg

Skin Rabbit LD₅₀ For Ethylene Glycol 19.5 g/kg

Intravenous Rat LD₅₀ For Ethylene Glycol 3260 mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity : None identified.

Reproductive Effects : None identified.

Target Organs :

Respiratory system, lungs, liver, kidneys, blood, central nervous system, gi tract

Medical Conditions Generally Aggravated By Exposure : None identified

Primary Routes Of Entry : Inhalation, ingestion, absorption, skin contact, eye contact

FIRST AID MEASURES

Ingestion: Call A physician. If swallowed, if conscious, give large amounts of water. Induce vomiting.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.

Skin Contact: In Case of contact, flush skin with water.

Eye Contact: In Case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection:

Respiratory protection required if airborne concentration exceeds TLV. At concentrations above 50 ppm, a self-contained breathing apparatus is advised.

Eye/Skin Protection: safety goggles, uniform, apron, rubber gloves are recommended.

Storage Requirements :

Keep container tightly closed. Suitable for any general chemical storage area. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge :

Wear suitable protective clothing. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

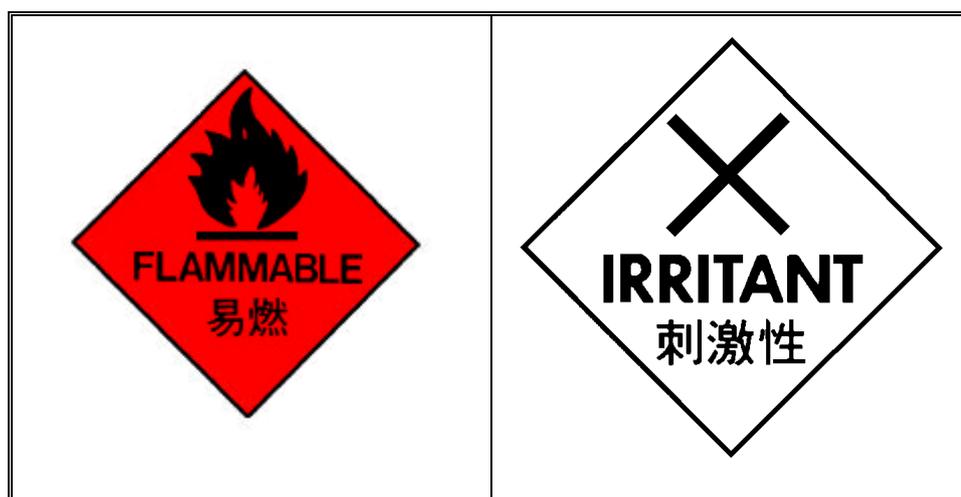
MSDS**Ethylbenzene****0306****PRODUCT INFORMATION**

Product: Ethylbenzene

Chinese Name: 乙苯

Chemical Formula : $C_6H_5C_2H_5$

CAS. No.: 00100-41-4

RISK SYMBOL**PHYSICAL DATA**

Appearance: Colorless liquid.

Odor: Aromatic.

Vapour Pressure: 7.1 mmHg @ 20°C

Vapor Density: 3.66

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Boiling Point: 277°F
Solubility In Water: 0.015% @ 25°C
Specific Gravity: 0.864 @ 25/25°C

FIRE AND EXPLOSION DATA

Flammable Properties

Flash Point: 70°F; 21°C

Method Used: TCC

Flammability Limits

LFL: 1.0%

UFL: 6.7%

Fire Fighting Instructions:

Keep vapors away from possible ignition sources. Vapors are heavier than air; be aware of their collecting in low areas. Do not extinguish fire but eliminate supply if possible.

Extinguishing Media:

Water fog, foam (considered most effective), carbon dioxide, dry chemical.

Protective Equipment For Fire-Fighters: Use positive-pressure, self-contained breathing apparatus.

REACTIVITY DATA

Conditions To Avoid:

Material can be ignited under almost all normal temperature conditions. Keep away from possible ignition sources such as flames and spark-producing equipment.

Incompatibility With Other Materials: Oxidizing material e.g. perchlorates, calcium hypochlorites, etc.

Hazardous Decomposition Products: None known.

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Eye:

May cause slight eye irritation. May cause very slight transient (temporary) corneal injury. Vapors may irritate eyes.

Skin:

Prolonged or repeated exposure may cause skin irritation, even a burn. May cause drying or flaking of skin. A single prolonged skin exposure is not likely to result in the material being absorbed through skin in harmful amounts.

Ingestion:

Single dose oral toxicity is low. If aspirated (liquid enters the lung), may cause lung damage or even death due to chemical pneumonia.

Inhalation:

Excessive exposure may cause irritation to upper respiratory tract and lungs. Signs and symptoms of excessive exposure may be anesthetic or narcotic effects. Lethargy may be a sign or symptom of excessive exposure.

Systemic (Other Target Organ) Effects:

Excessive vapor concentrations are attainable and could be hazardous on single exposure. Excessive exposure may cause liver, kidney, lung and possibly blood effects. Although one early inhalation study reported an adverse effect on the testes of experimental animals, recent more comprehensive studies have not shown this to be an effect of ethylbenzene.

Cancer Information: Ethylbenzene did not cause cancer in long-term studies.

Teratology (Birth Defects):

Has caused birth defects in laboratory animals. Has been toxic to the fetus in laboratory animals at doses nontoxic to the mother.

Reproductive Effects: Available data are inadequate to determine effects on reproduction.

Acute

Skin: The LD₅₀ for skin absorption in rabbits is 15,400 mg/kg.

Ingestion: The oral LD₅₀ for rats is 3,500 mg/kg.

Mutagenicity:

Results of in vitro ('test tube') mutagenicity tests have been negative. Results of mutagenicity tests in animals have been negative.

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FIRST AID MEASURES
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Eyes: Irrigate immediately with water for at least 5 minutes.

Skin: Wash off in flowing water or shower.

Ingestion:

Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

Inhalation:

Remove to fresh air. If not breathing, give mouth- to-mouth resuscitation. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

Note To Physician:

The decision of whether to induce vomiting or not should be made by an attending physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. If burn is present, treat as any thermal burn, after decontamination. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient. Excessive exposure may aggravate preexisting liver and kidney disease.

PREVENTATIVE MEASURES

Exposure Guideline(S):

Ethylbenzene: ACGIH TLV and OSHA PEL are 100 ppm TWA; 125 ppm STEL. PELs are in accord with those recommended by OSHA in the 1989 revision of PELs.

Engineering Controls:

Control airborne concentrations below the exposure guideline. Use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

Eye Protection:

Use safety glasses. Where contact with liquid is likely, chemical goggles are recommended because eye contact with this material may cause discomfort, even though it is unlikely to cause injury.

Skin Protection:

For brief contact, no precautions other than clean body-covering clothing should be needed. Use impervious gloves when prolonged or repeated contact could occur.

Respiratory Protection:

Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator. For emergency and other conditions where the exposure guideline may be greatly exceeded, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply.

ENVIRONMENTAL PROTECTION DATA

Disposal:

Any disposal practice must be in compliance with all federal, state/provincial, and local laws and regulations. State/provincial and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations. Regulations may also vary in different locations. Chemical additions, processing, storage, or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate, or otherwise inappropriate. Waste characterization and disposal compliance are the responsibility solely of the party generating the waste or deciding to discard or dispose of the material. None of these waste management options should be considered 'arranging for disposal'. Do not allow into any sewers, on the ground, or into any body of water. The preferred waste management option is to: send to a properly licensed or permitted recycler, reclaimer, or incinerator.

Material Safety Data Sheet

City University of Hong Kong

MSDS**GLYCEROL, ANHYDROUS****0309****PRODUCT INFORMATION**

Product Name: Glycerol, Anhydrous

Chinese Name: 甘氨酸

Common Synonyms: 1,2,3-Propanetriol; Glycerin; Glycyl Alcohol

Chemical Family: Carbohydrates And Polysaccharides

Formula: $\text{HOCH}_2\text{CHOHCH}_2\text{OH}$

Formula Wt.: 92.10

CAS No.: 56-81-5

Product Use: Laboratory reagent

RISK SYMBOL

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City University of Hong Kong

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PHYSICAL DATA

Boiling Point: 290 °C (554 °F)
(At 760 mmHg)

Melting Point: 18 °C (64 °F)
(At 760 mmHg)

Specific Gravity: 1.26
(H₂O=1)

Solubility(H₂O): Complete (100%)

pH: N/A

Odor Threshold (ppm): N/A

Coefficient Water/Oil Distribution: N/A

Appearance & Odor: Clear, colorless liquid. Odorless.

Vapor Pressure (mmHg): <0.1
(20 °C)

Vapor Density (Air=1): 3.1

Evaporation Rate: N/A

% Volatiles By Volume: 0
(21 °C)

Physical State: Liquid

FIRE AND EXPLOSION DATA

Flash Point (Closed Cup): 198 °C (390 °F)

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - 0.9 %

Fire Extinguishing Media : Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures :

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards : Contact with strong oxidizers may cause fire or explosion.

Toxic Gases Produced : Carbon monoxide, carbon dioxide, acrolein

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions To Avoid: None identified

Incompatibles: Strong oxidizing agents, strong acids, strong bases

Decomposition Products: Carbon monoxide, carbon dioxide, acrolein

HEALTH HAZARD DATA

Effects Of Overexposure :

Inhalation: Coughing, difficult breathing

Skin Contact: Irritation, prolonged contact may cause dermatitis

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: Headache, nausea, vomiting, gastrointestinal irritation, convulsions, unconsciousness

Chronic Effects: None identified

Threshold Limit Value (TLV/TWA): 10 mg/m

Short-Term Exposure Limit (STEL): Not established

Permissible Exposure Limit (PEL): 10 mg/m

Toxicity Of Components :Oral Rat LD₅₀ For Glycerol, Anhydrous

12.6 g/kg

Intraperitoneal Mouse LD₅₀ For Glycerol, Anhydrous

63 mg/kg

Subcutaneous Rat LD₅₀ For Glycerol, Anhydrous

100 mg/kg

Intravenous Rat LD₅₀ For Glycerol, Anhydrous

5566

mg/kg

Carcinogenicity: NTP: No IARC: No Z LIST: No OSHA REG: No

Carcinogenicity : None identified.

Reproductive Effects : None identified.

Target Organs : Eyes, skin, mucous membranes

Medical Conditions Generally Aggravated By Exposure : None identified

Primary Routes Of Entry : Eye contact, skin contact, inhalation, ingestion

FIRST AID MEASURES

Ingestion:

If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact: In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation:

Use general or local exhaust ventilation to meet TLV requirements. Respiratory Protection: Respiratory protection required if airborne concentration exceeds TLV. At concentrations above 10 mg/m³, a dust/mist respirator is recommended.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

Storage Requirements :

Keep container tightly closed. Suitable for any general chemical storage area. Isolate from incompatible materials.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge :

Wear suitable protective clothing. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS MAGNESIUM SULFATE ,ANHYDRATE 0311

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PRODUCT INFORMATION

Product Name: Magnesium Sulfate

Chinese Name: 硫(VI)酸鎂

Synonyms: Magnesium sulfate

CAS No: 7487-88-9

Molecular Weight: 246.47

Chemical Formula: MgSO₄

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RISK SYMBOL

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PHYSICAL DATA

Appearance: Transparent crystals, or white powder.

Boiling Point: Not applicable.

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Odor: Odorless.
Melting Point: 1124 °C (2055 °F) Decomposes.
Solubility: Very soluble in water.
Vapor Density (Air=1): No information found.
Density: 1.67 g/ml @ 4°C
Vapor Pressure (mm Hg): No information found.
pH: Aqueous solution is neutral or slightly acid.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information: Use protective clothing and breathing equipment appropriate for the surrounding fire.

REACTIVITY DATA

Stability:
Stable under ordinary conditions of use and storage. Loses some moisture on exposure to dry air at room temperatures.

Hazardous Decomposition Products: Oxides of sulfur and the contained metal.
Hazardous Polymerization: Will not occur.
Incompatibilities:
Ethoxy ethyl alcohols, arsenates, phosphates, tartrates, lead, barium, strontium, and calcium

Conditions to Avoid: Heat, moisture, incompatibles.

HEALTH HAZARD DATA

Inhalation: Dust may be slightly irritating. Sore throat or coughing may occur.

Ingestion:

Since magnesium salts are slowly absorbed, abdominal pain, vomiting and diarrhea may be the only symptoms. However, if elimination is blocked by bowel blockage or other reasons, CNS depression, lack of reflexes, hypocalcemia (deficiency of calcium in the blood) may occur.

Skin Contact: No adverse effects expected but may cause minor skin irritation.

Eye Contact: No adverse effects expected but dust may cause mechanical irritation.

Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Contact:

Wash thoroughly with running water. Get medical advice if irritation develops.

Note to Physician:

IV administration of calcium gluconate will partially reverse the effects of acute magnesium toxicity. Ventricular support with calcium chloride infusion and mannitol forced diuresis has also been successful.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage :

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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ENVIRONMENTAL PROTECTION DATA

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Disposal Considerations:

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PENTANE****0332****PRODUCT INFORMATION**

Chemical Name and Synonyms: Pentane, n-Pentane; Normal pentane

Chinese Name: 戊烷

Chemical Family: Aliphatic Hydrocarbon

Chemical Formula: C_5H_{12}

Product Use: Laboratory solvent

CAS No.: 109-66-0

RISK SYMBOL**PHYSICAL DATA**

Odour and Appearance: Colourless liquid; gasoline-like odour

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The above information is believed to be accurate to the best of our knowledge.
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Odour Threshold (ppm):

300-500 ppm; poor warning properties, odour threshold about the same as TLV

Vapour Pressure (mm Hg): 500 mm Hg at 25°C

Vapour Density (Air=1): 2.48

Evaporation Rate: 28.6 (butyl acetate = 1)

Boiling Point (°C): 35 - 36°C

Freezing Point (°C): -129.7°C

pH: Not applicable

Specific Gravity: 0.6262

Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability:

Extremely flammable liquid and vapour. Vapours form explosive mixtures with air. Vapour is heavier than air and may travel considerable distance to source of ignition and flash back. Liquid can float on water and spread fire.

Extinguishing Media:

Foam, dry powder or carbon dioxide. Water is ineffective for fighting fire, but can be used to cool containers and disperse vapours. Firefighters must wear full face-piece, positive-pressure self-contained breathing apparatus and full Bunker Gear.

Flash Point (Method Used): -49°C (TCC)

Autoignition Temperature: 260°C

Upper Flammable Limit (% by volume): 7.8%

Lower Flammable Limit (% by volume): 1.5%

Hazardous Combustion Products: CO, CO₂

Sensitivity to Impact: None identified

Sensitivity to Static discharge: May be ignited by static discharge

REACTIVITY DATA

Chemical Stability: Stable

Incompatibility with other substances:

Strong oxidizing agents can increase the risk of fire and explosion

Reactivity: Avoid heat, sparks and open flame, and oxidizing materials

Hazardous Decomposition Products: Carbon oxides formed when burned.

HEALTH HAZARD DATA

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Toxicological Data:

LD₅₀: (ivn, mouse) 446 mg/kg

LC₅₀: (mouse) 130,000 ppm/5 min.; (rat) 364 g/m³/4h

Effects of Acute Exposure to Product:

Inhaled:

No symptoms observed after 10 min of exposure to 5,000 ppm. Higher concentrations may cause dizziness, disorientation, headache, excitement, drowsiness, incoordination, hypersensitivity, tremors, hyperactivity, anesthesia, respiratory and cardiac effects. 130,000 ppm reported to be lethal.

In contact with skin:

Brief contact is not irritating. Contact with liquid for 1 to 5 hours may cause defatting, drying, itching, redness, swelling and burning.

In contact with eyes: May cause slight irritation

Ingested:

Oral toxicity is low, but aspiration of the liquid into the lungs can result in chemical pneumonitis or pulmonary edema.

Effects of Chronic Exposure to Product:

Prolonged or repeated skin contact can cause irritation and dermatitis. Chronic peripheral neuropathy has been reported among workers exposed to solvent containing 80% pentane, 14% heptane, and 5% hexane.

Carcinogenicity: Insufficient data available. Probably not carcinogenic.

Teratogenicity: No information available

Reproductive Effects: Insufficient data available

Mutagenicity: Negative in Ames test

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

Immediately flush eyes with warm running water for at least fifteen (15) minutes, holding eyelids open while flushing. If irritation persists, repeat flushing and obtain medical advice.

Skin:

Immediately flush exposed area with large amounts of warm running water while removing contaminated clothing (including rings, watches, belts, and shoes). Continue flushing the area up to twenty (20) minutes. If irritation persists, obtain medical advice.

Inhalation:

IMMEDIATELY remove casualty from contaminated area to fresh air (caution must be used by rescuers to avoid exposure to contaminating fumes.) Give oxygen and get medical attention for any breathing difficulty. If breathing has stopped give artificial respiration. If breathing and pulse are absent, give CPR. IMMEDIATELY OBTAIN MEDICAL ATTENTION. Stay with casualty until medical assistance is reached.

Ingestion:

Do not induce vomiting. Danger of aspiration with emesis. If casualty is alert and not convulsing, rinse out mouth with water and give 2 to 4 glasses of water to drink to dilute material. Immediately get medical attention. If spontaneous vomiting occurs have casualty lean forward with head down to avoid breathing in of vomitus.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust required.

Respiratory Protection:

Up to 1200 ppm: NIOSH/MSHA approved supplied-air respirator. Up to 1500 ppm: full face-piece supplied-air respirator or self-contained breathing apparatus. Higher or unknown concentrations, as in fire or spill conditions: positive-pressure, full face-piece self-contained breathing apparatus, or positive-pressure, full face-piece supplied-air respirator with an auxiliary positive-pressure self-contained breathing apparatus.

Eye Protection: Chemical safety goggles and/or face shield.

Skin Protection:

Viton gloves. Other protective clothing, sleeves, apron, coveralls, boots, sufficient to prevent contact.

Other Personal Protective Equipment: Safety shower and eye wash readily available in work area.

Storage Requirements:

Store in suitable, labelled containers, a cool, dry, well-ventilated area, out of direct sunlight. Keep tightly closed. Keep away from heat, sparks and flame. May develop pressure; refrigerate before opening (boiling point 36°C). Store away from any incompatible materials (e.g. Oxidizing agents).

Protect from damage and inspect frequently for signs of damage and/or leaking. Storage area should have raised sills or ramps to contain leaks and/or conduct them to a safe area.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Evacuate area, and provide maximum ventilation. Eliminate all sources of ignition. Cleanup personnel must wear protective equipment and clothing sufficient to prevent inhalation of mists or vapours and contact with skin and eyes. They must also be thoroughly trained in the hazards of this material. Do not touch spilled material. Contain spill with activated carbon adsorbent. Prevent from entering sewers or waterways. Collect contaminated adsorbent in labelled containers and hold for disposal. Wash site of spill thoroughly with detergent and water.

Handling Procedures and Equipment:

Personnel working with this substance must be thoroughly trained in its hazards and its safe use. Material is extremely flammable. Keep away from heat, sparks, flame, and all sources of ignition. Ground and bond drums, transfer vessels, hoses and piping, during liquid transfer. Ground clips must contact bare metal. Use non-sparking tools. Use inert gas in containers or storage vessels to reduce fire/explosion hazard. Keep work area free of other materials that can burn. Keep aisles and exits clear of obstruction. Use the smallest possible amount in well-ventilated area, away from any incompatible materials, particularly oxidizing agents. Do not return contaminated material to the original container. Do not transfer liquids using pressure. Have absorbents readily available for leaks or spills. Have appropriate fire extinguishers available.

Material Safety Data Sheet

City University of Hong Kong

MSDS**STYRENE****0336****PRODUCT INFORMATION**

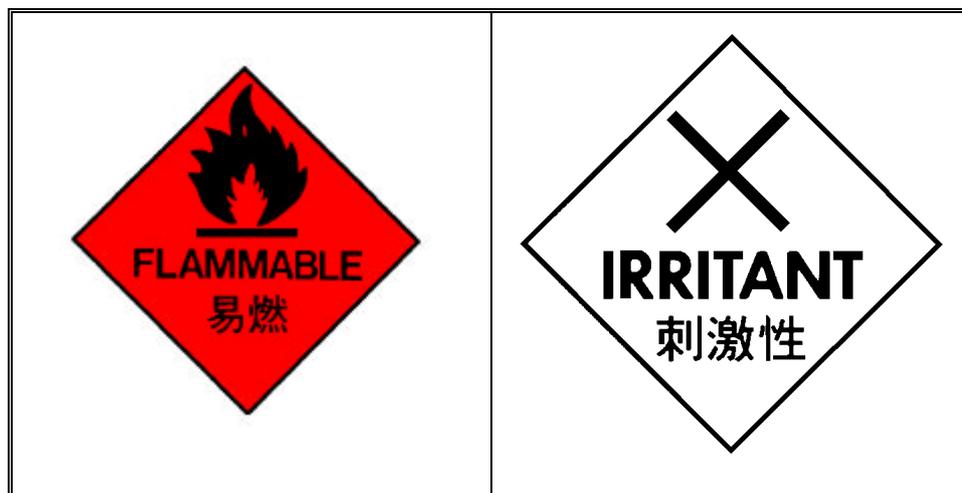
Chemical Name : Styrene

Chinese Name: 苯乙烯

Trade Name/Synonyms Styrene, Vinylbenzene, Ethenylbenzene, Styrol

Product Use : Monomer for polystyrene, elastomers, plastics, resins, polyesters

CAS No.: 100-42-5

RISK SYMBOL**PHYSICAL DATA**

Physical State : Liquid

Odour : Sweet, aromatic at low concentrations; sharp, penetrating, disagreeable at high concentrations.

Odour Threshold : 0.009 ppm (perception); 0.05-0.96 ppm (recognition)

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Appearance : Clear, colourless
Specific Gravity : 0.904 at 20°C
Freezing Point : -30.6°C
Boiling Point : 144.5°C
Vapor Pressure : 5 mm Hg (0.67 kPa) at 20°C
Vapor Density (air=1) : 3.6
Evaporation Rate: (n-Butyl acetate=1) Not available
Volatile, Percent by Volume : 100
Solubility in Water at 20°C : 0.032 wt.%
pH : Not applicable
Water/Oil Distribution Coefficient : 2.95 (log p(OCT))

FIRE AND EXPLOSION DATA

Flammable/Combustible (yes/no) : Yes

If yes, under what conditions? Temperature above 31°C and presence of an ignition source.

Extinguishing Media : Water fog, foam, carbon dioxide, dry chemical

Special Firefighting :

Wear NIOSH approved self-contained breathing Instructions apparatus. Water should be used to keep fire- exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapours and to protect the workers. Do not get water inside containing vessels.

Flashpoint and Method : 31.0°C (TCC)

Lower Explosive Level (% volume) : 1.1%

Upper Explosive Level (% volume) : 6.1%

Auto Ignition Temp. : 490°C

Impact/Shock Sensitivity : Not available

Rate of Burning : Not available

Sensitivity to Static Discharge : Not available

Hazardous Combustion Products :

Acid vapour upon heating. Production of carbon monoxide and carbon dioxide.

REACTIVITY DATA

Chemically Stable (yes/no): No

If no, under what conditions?

Polymerizes slowly and discolours on exposure to light and air at room temperature.

Incompatible with other substances: Yes

If yes, which ones?

Metal salts, acids (sulphuric and chlorosulphonic acids), caustic, butyllithium, dibenzoyl peroxide, aluminum chloride, ferric chloride, chlorine gas, oleum, peroxides and oxidizing agents

Conditions of Reactivity:

Hazardous polymerization (exothermic) will occur if inhibitor is depleted or if styrene is heated.

Hazardous Decomposition

Acid vapour upon heating. Production of Products carbon monoxide, carbon dioxide and styrene oxide.

HEALTH HAZARD DATA

Eye Effects: Eye irritant.

Skin Effects: Skin irritant.

Acute Oral Effects: LD₅₀; 320 mg/kg (oral, mouse)

Acute Inhalation Effects : LC₅₀; 2800 ppm/4H (Rat, inhal.)

Irritancy of Product :

Skin, eye and respiratory irritant. Irritation can occur from brief exposures to 200 ppm or longer exposures at 100 ppm.

Sensitization : Not a sensitizer

Synergism with : None known

Carcinogenicity :

The International Agency for Research on Cancer (IARC) has classified styrene as a possible carcinogen to human's bases on "inadequate evidence" in humans, "limited evidence" in animals and "other relevant data". These "other relevant data" demonstrate that styrene oxide (a metabolite of styrene) is known to induce cancer in animals. Additionally, styrene has been shown to be mutagenic in several "in vitro" assays. The following four points should be considered when evaluating styrene's alleged carcinogenicity. 1) Ten epidemiology studies conducted on over 50,000 styrene-exposed workers, covering a 45- year period, showed no evidence of a causal link between exposure to styrene and any type of cancer. 2) Eleven bio-assays on styrene showed no consistent findings and all the studies have major shortcomings either in protocol design or with the interpretation of results. 3) Metabolism data on styrene oxide was cited in support of the reclassification of styrene. Yet, current research is inadequate in assessing the relevance of the toxicity of styrene oxide to styrene, the issue currently being pursued in the U.S. and Europe to determine the relevance of styrene oxide to styrene. 4) Mutagenicity data used by IARC have shown inconsistent results. NTP, ACGIH, EPA, NIOSH and OSHA do not support IARC's classification of styrene as a possible human carcinogen (Group 2B). Preliminary results of inhalation studies indicate that rats exposed to 800 parts per million (ppm) styrene suffered hearing loss. Relevance to occupational exposures to styrene has not been established.

Emergency Overview:

Styrene is a clear colourless oily flammable liquid with a sweet aromatic odour at low concentrations and sharp, penetrating disagreeable odour at higher concentrations. High concentrations will cause eye,

nose and throat irritation, dizziness and light headedness. Hazardous polymerization is possible and may be initiated by heat, acidic or basic conditions and some sorbents.

Potential Health Effects:

Skin:

Liquid and vapours are very irritating to skin. May cause defatting dermatitis. Repeated or prolonged skin contact may cause blistering and dermatitis (itching, drying, redness).

Eyes: Liquid and vapours are very irritating to eyes.

Breathing:

Vapours are very irritating to nose and throat. Breathing vapours at concentrations above recommended exposure limits can cause headache, nausea, cramps, loss of appetite, vomiting, dizziness, tremors, weakness, drowsiness; decreased appetite, dexterity and coordination. May cause narcosis and central nervous system (CNS) depression. Extreme exposures may cause unconsciousness or death. Possible long term effects are decreased coordination and concentration and possible neurotoxic effects.

Swallowing:

Styrene may cause irritation of the mouth and throat, nausea vomiting and loss of appetite.

Chronic Hazards :

Inhalation:

Field studies of workers exposed to styrene found symptoms of CNS depression (decreased coordination and concentration) and abnormal EEG patterns (electrical activity of the brain) in some of the workers. These effects were thought to be reversible. Skin Contact: Repeated or prolonged contact may cause blistering and dermatitis (itching, drying, redness). Effects on the Eyes: A study of workers in a styrene plant found no evidence of eye disorders, other than occasional irritation.

Reproductive :

No human information. No adverse reproductive effects Effect were seen in a 3-generation rat study.

Teratogenicity :

In 2 case reports, women exposed to styrene at work during pregnancy gave birth to children with central nervous system defects. The significance of the reports is unclear because the women were exposed to other chemicals and such defects can occur by chance. Styrene was not teratogenic in two animal tests.

Mutagenicity :

Styrene and styrene oxide (a metabolite) are positive mutagens in a number of short term tests.

Carcinogenicity : Styrene is "Possibly carcinogenic to humans" (Group 2B, IARC, 1987)

FIRST AID MEASURES

Skin : Remove contaminated clothing. Wash skin thoroughly with soap and water.

Eye : Flush immediately with clean water for at least 15 minutes. Obtain medical attention.

Breathing : Remove to fresh air. Assist breathing if necessary. Obtain medical attention.

Swallowing : DO NOT INDUCE vomiting. Obtain medical attention immediately.

An Emergency Medical Response Protocol is available for this product. These are available to first responders and medical personnel.

NOTES TO PHYSICIAN:

Styrene is rapidly absorbed by the lungs and gastrointestinal tract. It is not considered highly toxic but exposure to high concentrations will produce CNS depression: headache, nausea, vomiting, dizziness, euphoria, poor judgement, slurred speech and behavioral disturbances. Severe effects include blurred vision, delirium, tremors, shallow and rapid respiration, unconsciousness, coma and death. There is no specific antidote for styrene poisoning. Treatment consists of supportive measures such as oxygen (by mask). Sympathomimetics or catecholamines should be avoided or used with caution to avoid inducing ventricular fibrillation.

PREVENTATIVE MEASURES

Engineering Controls:

Sufficient to keep exposure levels below permissible limits. In confined areas, local and general ventilation should be provided to maintain airborne concentrations below permissible exposure limits.

Ventilation systems must be designed according to approved engineering standards.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Gloves:

Use chemically resistant gloves (PVA, Viton) to minimize skin contact. Respiratory Wear a NIOSH approved organic vapour respirator if necessary, to prevent over-exposure.

Eye: Monogoggles or face shield.

Footwear: Appropriate safety footwear.

Clothing Appropriate to prevent skin contact. Chemical resistant apron if splashing is possible.

Other: Not applicable.

PPE must not be considered a long term solution to exposure control. PPE must be accompanied by employer programs to properly select, maintain, clean, fit and use. Consult a competent industrial hygiene resource to determine hazard potential and/or the PPE manufacturers to ensure adequate protection.

Exposure Limits:

Styrene:

ACGIH TLV-TWA = 50 ppm,

TLV-STEL = 100 ppm - Skin notation;

OSHA PEL- TWA = 100 ppm

Mexico: Maximum Permissible Concentration TWA = 50 ppm;

STEL = 100 ppm Consult local authorities for acceptable exposure limits.

Storage:

Store below 31°C. Use t-Butyl catechol (TBC) at levels between 10 ppm and 50 ppm to inhibit chemical reaction. Store in totally enclosed equipment, designed to avoid human contact. Avoid storage with incompatible materials. Monitor inhibitor content and polymer formation. Complete elimination of dissolved oxygen in the monomer rapidly causes polymerization.

Handling:

Handle as flammable liquid. No smoking or open flame in storage, use or handling areas. Use explosion proof electrical equipment. Ensure proper electrical grounding procedures are in place.

ENVIRONMENTAL PROTECTION DATA

Spill or Leak Response:

Styrene is a flammable liquid subject to polymerization if the inhibitor becomes depleted. Spill or leak area should be isolated immediately for 25-50 meters (80-160 feet). Keep upwind. Keep out of low areas. Ventilate closed spaces before entering. Shut off leak, if without risk. Use water spray to disperse vapours. Eliminate all ignition sources, contain spill and use sorbent materials. Polymerization reactions can occur with some sorbent materials: acids, bases and/or soil. Pretesting of available sorbents for compatibility under controlled conditions is recommended. Use clean non-sparking materials to collect absorbed materials. Recover styrene; prevent it from entering sewer, drains or waterways. Restrict access of unprotected personnel. SCBA and protective clothing must be worn. For large spills consider evacuation for 300 meters (1000 feet). A vapour suppressing foam or water spray may be used to control vapours. Do not get water inside containing vessels.

Material Safety Data Sheet

City University of Hong Kong

MSDS**THIONYL CHLORIDE****0337****PRODUCT INFORMATION**

Product Name: Thionyl Chloride

Chinese Name: 亞硫[®]氯

Chemical Family: Thionyl Chloride.

CAS No.: 7719-09-7

Material Use: chlorinating agent. Esterifying agent. dehydrating agent.

RISK SYMBOL**PHYSICAL DATA**

Physical State :Liquid.

Odour : Sharp, irritating.

Specific Gravity : 1.64. At 25°C.

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The above information is believed to be accurate to the best of our knowledge.
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Odour Threshold (ppm) : Not Available.
Vapour Pressure (mm Hg) : 97 mm Hg.
Vapour Density (Air=1) : Not Available.
Evaporation Rate: Not available.
Boiling Point (°C) :76.
pH : Not Applicable.
Solubility In Water (% W/W) :Reacts.
Coefficient Of Water\Oil : Not Applicable.
Distribution
Freezing Point (°C) :-104.5.
Melting Point (°C) :Not Available.

FIRE AND EXPLOSION DATA

Flash Point (°C), Method : Not Applicable.
Auto Ignition Temperature (°C) : Not Available.
Upper Flammable Limit (% vol) : Not Available.
Lower Flammable Limit (% vol) : Not Available.
Extinguishing Media :
Carbon dioxide. Dry chemical. Water will react with the product, generating irritating gases. However, water spray should be used to keep fire exposed containers cool and to help scrub acid gases from the air.

Hazardous Combustion Products : By fire, protect against potentially toxic and irritating fumes.
Sensitivity To Mechanical Impact : Not Applicable.
Sensitivity To Static Discharge :Not Applicable.

REACTIVITY DATA

Incompatibility :Water reactive. Organic chemicals. alkali and reducing materials.
Reactivity Conditions :If highly heated and on contact with organic substances.
By Thermal Decomposition: Chlorine.
Hazardous Products Of Decomposition :
Sulphur chloride, sulphur dioxide. In contact with water: Sulphur dioxide. Hydrochloric acid.

HEALTH HAZARD DATA

Route Of Entry: Eye contact. Skin contact. Inhalation.
Eye Contact: Corrosive. Can cause ocular burns.
Skin Contact: Corrosive. Can cause chemical burns.

Skin Absorption: Not Available.

Inhalation (Acute): Corrosive to mucous membranes. May cause coughing. May cause delayed lung injury.

Ingestion: Not Available.

Effects Of Chronic Exposure: May cause respiratory damage.

Acute Oral Toxicity (LD₅₀): Not Available.

Inhalation LC₅₀: 1274 ppm (Rat - 1 Hour). 558 ppm (Rat - 4 Hour).

Irritancy Of Material: Severe.

Sensitizing Capability Of Material: Not Available.

Carcinogenicity Of Material: Not Applicable.

Teratogenicity: Not Available.

Mutagenicity: Not Available.

Reproductive Effects: Not Available.

Synergistic Materials: Not Available.

NOTE:

Persons with impaired pulmonary function may be more susceptible to the effects of this product.

FIRST AID MEASURES

Eye Contact:

In case of contact, immediately flush eyes, keeping eyelids open, with plenty of water for at least 15 minutes.

Skin Contact:

In case of contact, immediately flush skin with plenty of soap and water. Remove contaminated clothing. Wash clothing before reuse.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Obtain medical attention.

Ingestion:

Dilute with a small amount (200-250 ml) of water. Do not induce vomiting. Get immediate medical attention.

PREVENTATIVE MEASURES

Protective Equipment:

Eye/Type: Splash proof chemical goggles or 8" face shield.

Respiratory/Type :

Wear an approved respirator for this product mixture. Do not exceed the use limits of the respirator.

Gloves/ type : Neoprene, PVC, polyethylene or viton.

Clothing/type : Wear adequate protective clothes.

Footwear/type : Safety boots per local regulations.

Other/type: Eyewash fountain. Emergency shower should be in close proximity.

Ventilation Requirements :

Wear an appropriate, properly fitted respirator when contaminant levels exceed the recommended exposure limits.

Handling Procedures :

Avoid skin and eye contact. Avoid breathing vapours. Maintain good personal hygiene.

Storage Needs :

Store in a cool, dry and well ventilated area. Keep away from heat, sparks, and open flames. Store away from sunlight. Store in tightly closed containers to prevent moisture contamination. Containers should be equipped with pressure relief devices made of compatible materials.

ENVIRONMENTAL PROTECTION DATA

Leak/Spill :

Evacuate all non-essential personnel. Wear full protective equipment, including respiratory equipment during clean-up. Cover with soda ash and/or lime. Vapour clouds formed by reaction of the spilled material with atmospheric moisture can be controlled by water fog or spray. Shovel or pump to drum or salvage tank.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Heptane****0341**

PRODUCT INFORMATION

Chemical Name: Heptane

Chinese Name: 庚烷

Chemical Family: Aliphatic Hydrocarbon

Synonyms: n-Heptane

Molecular Weight: 100.21

Formula: C₇H₁₆

CAS Number: 142-82-5

RISK SYMBOL



PHYSICAL DATA

Boiling Point, 760 mm Hg: 98.43°C

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The above information is believed to be accurate to the best of our knowledge.
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Vapor Pressure at 20°C: 35.5 mm Hg
% Volatiles by Volume: ca 100
Freezing Point: -90.6°C
Vapor Density (air=1): 3.5
Specific Gravity (H₂O=1): @ 20°C 0.684
Evaporation Rate: (BuAc=1) ca 4
Solubility in Water: @ 25°C .0003%

FIRE AND EXPLOSION DATA

Flash Point (test method): -4°C (Tag closed cup)
Auto Ignition Temperature: 223°C
Flammable Limits in Air % by Volume: Lower Limit 1.05 Upper Limit 6.7
Unusual Fire and Explosion Hazards: Volatile and flammable
Extinguishing Media: Carbon dioxide, dry chemical or foam
Special Fire Fighting Procedures:
Water will not be effective in extinguishing a fire and may spread it, but a water spray can be used to cool exposed containers. Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Not expected to occur
Appearance and Odor: Clear, colorless liquid with a mild hydrocarbon odor
Conditions to Avoid: Heat, sparks, open flame, open containers, and poor ventilation
Materials to Avoid: Strong oxidizing agents
Hazardous Decomposition Products:
Incomplete combustion can generate carbon monoxide and other toxic vapors

HEALTH HAZARD DATA

OSHA	TWA	400 ppm
	STEL	500 ppm
OSHA/NIOSH		4,250 ppm
	Ceiling	not listed

Odor Threshold
ACGIH TLV-TWA 400 ppm
 TLV-STEL 500 ppm
 NSC/NIOSH 200 ppm

NIOSH 10-hour TWA 85 ppm
 15-min Ceiling 440 ppm

Carcinogenic Data : Heptane is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Primary Routes of Entry :

Heptane may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation: Exposure can cause dizziness, slight nausea, and mucus membrane irritation.

Eye Contact: Liquid and high vapor concentration can cause irritation.

Skin Contact:

Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin.

Ingestion: Can cause gastrointestinal tract discomfort.

Effects of Overexposure :

Heptane is a mild eye and mucous membrane irritant, primary skin irritant, and central nervous system depressant. Acute exposure causes irritation, drowsiness, loss of appetite, nausea, and muscular incoordination. Narcosis may occur at elevated concentrations.

Medical Condition Aggravated by Exposure :

Preclude from exposure those individuals susceptible to dermatitis.

FIRST AID MEASURES

Inhalation:

Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse, administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact:

Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact:

Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion:

Call local Poison Control Center for assistance. Contact physician immediately. Aspiration Hazard - Do not induce vomiting.

PREVENTATIVE MEASURES

Ventilation:

Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory:

Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes:

Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin:

Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or nitrile rubber offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to Heptane may require additional protective equipment.

Storage:

Heptane should be protected from temperature extremes and direct sunlight. Proper storage of Heptane must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, Heptane should be stored in an acceptably protected and secure flammable liquid storage room.

Other:

Emergency eyewash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

ENVIRONMENTAL PROTECTION DATA

Spill Control:

Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

CERCLA Reportable Quantity: none

Material Safety Data Sheet

City University of Hong Kong

MSDS**PETROLEUM ETHER****0346****PRODUCT INFORMATION**

Chemical Name and Synonyms: Petroleum ether; Ligroine; Petroleum benzin

Chinese Name: 石油醚

Chemical Family: Paraffin hydrocarbon

Chemical Formula: Mixture

Product Use: Laboratory solvent

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Odour and Appearance: Clear liquid, mild gasoline-like odour

Odour Threshold (ppm): 300-500 ppm

City University of Hong Kong

The above information is believed to be accurate to the best of our knowledge.
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Vapour Pressure (mm Hg): 7.99 psi @ 20°C
Vapour Density (Air=1): 2.5
Evaporation Rate: >1 (n-butyl acetate =1)
Boiling Point (°C): 37 to 60°C
Freezing Point (°C): -73°C
pH: Not applicable
Specific Gravity: 0.643
Coefficient of Water/Oil distribution: No data

FIRE AND EXPLOSION DATA

Flammability: Flammable. Vapour can travel to distant sources of ignition and flash back
Extinguishing Media: Foam, dry chemical, CO₂
Flash Point (Method Used): -49°C (TCC)
Autoignition Temperature: 245°C
Upper Flammable Limit (% by volume): 7.8%
Lower Flammable Limit (% by volume): 1.4%
Hazardous Combustion Products: CO_x, hydrocarbons
Sensitivity to Impact: No
Sensitivity to Static discharge: May be ignited by static discharge

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances:
 Avoid strong oxidizing agents (e.g. Peroxides, nitrates and perchlorates), acids, bases, amines
Reactivity: Avoid heat, sparks and open flame.
Hazardous Decomposition Products: CO_x, hydrocarbons

HEALTH HAZARD DATA

Toxicological Data:
LD₅₀: (ivn, mouse) 40 mg/kg
LC₅₀: (inhalation, rat) 3400 ppm/4 hours
Effects of Acute Exposure to Product:

Inhaled:

High concentrations cause dizziness and headache, nausea, confusion and loss of consciousness.

In contact with skin:

Brief contact is not irritating. Extreme contact may cause itching, redness, pigmentation, swelling, burning and pain.

In contact with eyes:

May cause eye irritation including pain, inflammation of the iris and mucous membranes, redness and tearing.

Ingested:

May cause central nervous system depression, hemorrhaging of mucous membranes and diarrhea.

Effects of Chronic Exposure to Product:

Carcinogenicity: No information available

Teratogenicity: No information available

Reproductive Effects: Insufficient data

Mutagenicity: Negative in Ames Test

Synergistic Products: None known

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FIRST AID MEASURES
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Eyes:

IMMEDIATELY flush eyes with warm running water for a minimum of fifteen (15) minutes, holding eyelids open while flushing. If irritation persists repeat flushing and obtain medical advice immediately. (Flushing may be continued while casualty is transported to medical facility.)

Skin:

IMMEDIATELY flush exposed area with large amounts of warm running water while removing contaminated clothing (including rings, watches and shoes). Continue flushing the area up to twenty (20) minutes. If irritation persist, repeat flushing and obtain medical advice immediately.

Inhalation:

IMMEDIATELY remove casualty from contaminated area to fresh air (caution must be used by rescuers to avoid exposure to contaminating fumes). Five oxygen for breathing difficulty. If breathing has stopped give artificial respiration. If breathing and pulse are absent, give CPR. IMMEDIATELY OBTAIN MEDICAL ATTENTION. Stay with casualty until medical assistance is reached.

Ingestion:

Do not induce vomiting. Danger of aspiration with emesis. If casualty is alert and not convulsing, rinse out mouth with water. Immediately get medical attention. If spontaneous vomiting occurs have casualty lean forward with head down to avoid breathing in of vomitus.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation required.

Respiratory Protection:

NIOSH/MSHA approved respirator or self-contained breathing apparatus for exposures exceeding TLV.

Eye Protection: Chemical safety goggles.

Skin Protection: Neoprene gloves, Plastic apron, sleeves, boots, as appropriate.

Other Personal Protective Equipment: Safety shower and eye wash readily available in work area.

Handling Procedures and Equipment:

Keep away from heat, sparks, and flame and all sources of ignition. Ground and bond during liquid transfer. Use non-sparking tools. Avoid contact with eyes, skin and clothing. Avoid breathing vapour.

Storage Requirements:

Store in a cool, dry, well-ventilated area, out of direct sunlight. Keep away from incompatible materials and heat, sparks and flame.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Evacuate area, provide maximum ventilation and protect from ignition. Contain spill and collect using inert absorbent material. Transfer to container and arrange removal by disposal company. Wash site of spillage thoroughly with detergent and water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Mercury****0348****PRODUCT INFORMATION**

Chemical Name and Synonyms: Mercury, Quicksilver; Hydrargyrum

Chinese Name: 汞

Chemical Family: Metals

Chemical Formula: Hg

Product Use: Laboratory chemical

CAS No. : 7439-97-6

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Odour and Appearance: Silver-white, heavy, mobile, liquid metal. Odourless

City University of Hong Kong

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Odour Threshold (ppm): Not applicable
Vapour Pressure (mm Hg): 0.0012 mm Hg (20 °C)
Vapour Density (Air=1): 6.9
Evaporation Rate: Not available
Boiling Point (°C): 357
Melting Point (°C): -39 °C
pH: Not applicable
Specific Gravity: 13.6 (20 °C)
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Non combustible
Extinguishing Media: Dry chemical, CO₂, halon, water spray, standard foam.
Flash Point (Method Used): Not applicable
Autoignition Temperature: Not applicable
Upper Flammable Limit (% by volume): Not applicable
Lower Flammable Limit (% by volume): Not applicable
Hazardous Combustion Products:
At high temperatures, vaporizes to form extremely toxic fumes of mercury.

Sensitivity to Impact: None
Sensitivity to Static discharge: None

REACTIVITY DATA

Chemical Stability: Stable under ordinary conditions of use.
Incompatibility with other substances:
May react violently or explosively with acetylenes, ammonia, ethylene oxide, metal oxides, methyl silane, strong oxidants, metal carbonyls. Reacts with many metals (except iron) to form amalgams.

Reactivity: Mercury can attack copper and copper alloy materials
Hazardous Decomposition Products: Toxic fumes

HEALTH HAZARD DATA

Toxicological Data:
LD₅₀: (oral, human) 1,429 mg/kg
LC₅₀: Not available

Effects of Acute Exposure to Product:

Inhaled:

Irritating to upper respiratory tract causing cough, chest pains, chest tightness and difficulty in breathing, and chemical pneumonitis. Inhaled mercury vapour is readily absorbed causing systemic poisoning with such symptoms as headache, soreness of the mouth, loss of teeth, nausea and diarrhea.

In contact with skin:

Continual contact may allow the absorption of sufficient mercury to produce symptoms as listed in "Inhaled", above.

In contact with eyes:

Not a usual route of poisoning. May be irritating. Mercury can be absorbed through eye tissues, adding to systemic poisoning.

Ingested:

Gastrointestinal uptake of mercury is less than 5%, but its ability to penetrate tissues presents some hazard. Initial symptoms may be thirst, possible abdominal discomfort.

Effects of Chronic Exposure to Product:

Chronic exposure through any route can produce central nervous system damage. May cause muscle tremors, personality and behaviour changes, metallic taste, loosening of the teeth, digestive disorders, skin rashes and kidney damage. Cumulative.

Carcinogenicity: Carcinogen A4 - not classifiable as human carcinogen.

Teratogenicity:

Mercury has been known to adversely affect the fetus if the mother is exposed during pregnancy.

Reproductive Effects: No information available

Mutagenicity: No information available

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

Flush eyes thoroughly with gently running water for at least fifteen (15) minutes, holding eyelids open while flushing. Get medical advice if irritation develops.

Skin:

Remove contaminated clothing. Wash skin with plenty of water for at least fifteen (15) minutes. If irritation develops seek medical attention.

Inhalation:

Remove to fresh air. Give oxygen and get medical attention for any breathing difficulty. If breathing has stopped, start artificial respiration immediately.

Ingestion:

If the person is alert and not convulsing, give 2 to 6 glasses of water to drink immediately and induce vomiting by touching the back of throat with finger. Get medical attention immediately.

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PREVENTATIVE MEASURES

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Engineering Controls: Local exhaust ventilation required.

Respiratory Protection:

0.5 mg/m³ or less: chemical cartridge respirator with mercury compound protective cartridges or any supplied-air respirator; 1.25 mg/m³ or less: supplied-air respirator operated in continuous-flow mode or powered air-purifying respirator with mercury compound protective cartridges; 2.5 mg/m³ or less: full face-piece chemical cartridge respirator with mercury compound protective cartridges, or gas mask with canister to protect against mercury compounds, or supplied-air respirator with tight-fitting facepiece operated in continuous-flow mode, or powered air-purifying respirator with tight-fitting facepiece and cartridges to protect against mercury compounds, or full facepiece self-contained breathing apparatus, or full facepiece supplied-air respirator; up to 10 mg/m³: full facepiece supplied-air respirator; unknown concentrations: positive pressure full facepiece self-contained breathing apparatus, or positive pressure full facepiece supplied-air respirator with auxiliary positive pressure self-contained breathing apparatus.

Eye Protection: Chemical safety goggles

Skin Protection:

Wear impervious gloves (Barricade, Saranex) and other body- covering clothing sufficient to prevent contact.

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures and Equipment:

Only those who have been thoroughly trained in the hazards of this substance should work with it. Avoid all contact. Do not breathe vapour. Use with adequate ventilation. Use routine safe handling and good housekeeping procedures.

Storage Requirements:

Store in suitable, labelled containers in a cool, dry, well-ventilated area away from incompatible materials, sources of ignition, and excessive heat. Keep in strong, tightly closed containers. Protect from physical damage.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Cleanup personnel must wear protective equipment and clothing sufficient to prevent inhalation of vapours and all contact with skin, eyes and clothing. Collect all droplets and pools at once by means of suction pump and aspirator, bottle with a long capillary tube. Cover fine droplets in non-accessible cracks with calcium polysulfide and excess sulphur. Prevent from entering sewers or waterways. Combine all contaminated mercury in a tightly stoppered bottle.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Chloroacetic acid****0351****PRODUCT INFORMATION**

Product Name: Chloroacetic acid

Chinese Name: 氯乙酸

CAS: 79-11-8

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid.

Odor and Appearance: Pungent acidic odor.

Taste: Not available.

Molecular Weight: Not available.

pH (1% soln/water) : Not available.

City University of Hong Kong

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Colour: White.
Boiling Point: 189 °C (372.2 °F)
Melting Point: 62 °C (143.6°F)
Critical Temperature: Not available.
Specific Gravity: 1 (Water = 1)
Vapor Pressure: Not applicable.
Vapor Density: 3.3 (Air = 1)
Volatility: Not available.
Odor Threshold: Not available.
Evaporation rate: Not available.
Viscosity: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.
Dispersion Properties: Not available.
Solubility: Not available.

FIRE AND EXPLOSION DATA

The Product is: May be combustible at high temperature.

Auto-Ignition Temperature: 470°C (878°F)

Flash Points: CLOSED CUP: 126°C (258.8°F). (Pensky-Martens.)

Flammable Limit: Not available.

Products of Combustion:

Products of combustion: Very toxic substances including carbon monoxide, hydrochloric acid and formaldehyde are produced by the thermal decomposition of this product.

Fire Hazards in Presence of Various Substances: Not available.

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet.

REACTIVITY DATA

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Thermal decomposition occurs above 250C.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity:

Thermal decomposition products include toxic and corrosive hydrogen chloride gas, oxides of carbon and formaldehyde.

Conditions to Avoid:

Contact with strong bases, amines, base metals and prolonged storage at elevated temperatures should be avoided.

Special Remarks on Corrosivity: Not available.

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Potential Acute Health Effects:

Extremely hazardous in case of skin contact (corrosive), of eye contact (corrosive). Very hazardous in case of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death.

Potential Chronic Health Effects :

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY:

Not available. The substance may be toxic to kidneys, lungs, liver, heart, brain, upper respiratory tract, central nervous system (CNS), teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY:

Not available. The substance may be toxic to kidneys, lungs, liver, heart, brain, upper respiratory tract, central nervous system (CNS), teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to an highly

toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Other Toxic Effects on Humans:

Extremely hazardous in case of skin contact (corrosive), of eye contact (corrosive). Very hazardous in case of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death.

Special Remarks on Toxicity to Animals:

It has been reported the MCA, when administered to pregnant rats at 140mg/kg caused malformations in the cardiovascular system of the fetuses, however, skeletal malformations were not observed.

Special Remarks on Chronic Effects on Humans: No additional remark.

Special Remarks on Other Toxic Effects on Humans:

Inhalation Chronic Exposure:

Repeated or prolonged inhalation exposure may cause erosion of teeth, inflammatory and ulcerative changes in the mouth, and possible jaw necrosis. Nasal ulceration, bronchial irritation, and chronic cough may result from repeated or prolonged inhalation exposure. Gastrointestinal disturbances may be caused by repeated or prolonged inhalation.

FIRST AID MEASURES

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Skin Contact:

Get medical attention immediately. In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. A solution of sodium bicarbonate (3-5%) may be used to neutralize the monochloroacetic acid. When making the treatment bath, use approximately 1 lb of sodium carbonate (baking soda) per gallon of water.

Hazardous Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

Get medical attention immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Hazardous Inhalation: Not available.

Ingestion:

DO NOT induce vomiting. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

PREVENTATIVE MEASURES

Engineering Control:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Exposure Limits: Not available.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

ENVIRONMENTAL PROTECTION DATA

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Corrosive solid. Poisonous solid. Stop leak if without risk. DO NOT get water inside container. DO NOT touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all sources of ignition. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Spill:

Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHYL ACETATE****0353****PRODUCT INFORMATION**

Chemical Name and Synonyms: Methyl acetate; Acetic acid methyl ester, Methyl ethanoate

Chinese Name: 醋酸甲酯

Chemical Family: Saturated aliphatic carboxylic acid ester

Chemical Formula: $\text{CH}_3\text{COOCH}_3$

Product Use: Laboratory reagent

CAS No.: 79-20-9

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Odour and Appearance: Clear colourless to pale yellow liquid, pleasant, fruity odour.

City University of Hong Kong

The above information is believed to be accurate to the best of our knowledge.
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Odour Threshold (ppm):

180 ppm (detection), 300 ppm (recognition). Poor warning qualities, threshold about the same as TLV.

Vapour Pressure (mm Hg): 173 mm Hg at 20 °C

Vapour Density (Air=1): 2.55

Evaporation Rate (BuAc = 1): 11.8

Boiling Point (°C): 56.9 °C

Freezing Point (°C): -98 °C

pH: Can form acetic acid in presence of water, producing some acidity

Specific Gravity: 0.933 @ 20 °C

Coefficient of Water/Oil distribution: logP(oct)=0.18

FIRE AND EXPLOSION DATA

Flammability:

Extremely flammable liquid and vapour. Vapour is heavier than air and may travel considerable distance to source of ignition and flash back. Concentrated solutions in water may be flammable. Closed containers may rupture violently when heated.

Extinguishing Media:

Alcohol or polymer foam, dry chemical powder, carbon dioxide. Water is ineffective for fighting fire, but as spray or fog can be used to cool containers and disperse vapours or flush spills away from ignition sources. Firefighters must wear NIOSH/MSHA approved full face- piece, positive-pressure self-contained breathing apparatus and chemical splash suit or full Bunker Gear.

Flash Point (Method Used): -10 °C (CC)

Autoignition Temperature: 454 °C

Upper Flammable Limit (% by volume): 16%

Lower Flammable Limit (% by volume): 3.1%

Hazardous Combustion Products: Acrid fumes, CO_x

Sensitivity to Impact: None identified

Sensitivity to Static discharge:

Liquid will probably not accumulate static charge; vapours in the flammable range may be ignited by static discharge.

REACTIVITY DATA

Chemical Stability:

Stable in anhydrous state. May hydrolyze slowly to methanol and acetic acid in presence of water.

Incompatibility with other substances:

Increased risk of fire and explosion with oxidizers. May react vigorously with strong bases, strong acids. Contact of potassium tert-butoxide with methyl acetate vapour may cause ignition. Probably not corrosive to metal. Can attack some plastics.

Reactivity: Heat, sparks, flame, static electricity, all ignition sources.
Hazardous Decomposition Products: Methanol, acetic acid.

HEALTH HAZARD DATA

Toxicological Data:

LD₅₀: (oral, rat) >5,000 mg/kg; (oral, rabbit) 3,700 mg/kg; (dermal, rabbit) >5,000 mg/kg

LC₅₀: (rat) 16,000-32,000 ppm/4h

LCLO: (mouse) 11,300 ppm/4h

Effects of Acute Exposure to Product:

Inhaled:

Toxic. Exposure to high levels (5,000 to 10,000 ppm) is irritating to upper respiratory tract. Animal testing indicates that severe exposure can cause CNS depression with headache, drowsiness, dizziness.

In contact with skin:

Mildly irritating. Can be absorbed through skin, but not expected to be toxic by absorption.

In contact with eyes:

Animal testing indicates that liquid or vapour can cause moderate to severe irritation.

Ingested:

Toxic and irritating to gastrointestinal tract. Local application of one drop to tongue caused burning, reddening and swelling. Ingestion of small amounts may cause shortness of breath, headache, drowsiness, dizziness. Ingestion of large amounts may cause acidosis, vision impairment, possible death. Methyl acetate breaks down in the body to form methanol and acetic acid, which cause the effects.

Effects of Chronic Exposure to Product:

Prolonged or repeated skin exposure can cause dermatitis. No sensitization has been reported in testing with volunteers.

Carcinogenicity:

No human or animal information available. Not expected to be carcinogenic; metabolites are not carcinogenic.

Teratogenicity: No human or animal information available.

Reproductive Effects: No human or animal information available.

Mutagenicity: Negative in Ames test. Vapour mutagenic to yeast cells.

Synergistic Products: None known.

FIRST AID MEASURES

Eyes:

Immediately flush eyes with warm, gently running water for at least twenty (20) minutes, holding eyelids open while flushing. Take care not to flush contaminated water into unaffected eye. Get medical attention immediately.

Skin:

Immediately remove contaminated clothing (including rings, watches, belts and shoes.) Flush exposed area with large amounts of warm running water and non-abrasive soap for at least five to ten (5 to 10) minutes. Get medical attention. Decontaminate clothing before reuse, or discard.

Inhalation:

IMMEDIATELY remove casualty from contaminated area to fresh air (caution must be used by rescuers to avoid exposure to contaminating fumes.). Remove any sources of ignition. Give oxygen and get medical attention for any breathing difficulty. If breathing has stopped give artificial respiration. If breathing and pulse are absent give CPR. Immediately obtain medical attention. Stay with casualty until medical assistance is reached.

Ingestion:

Do not induce vomiting. If the casualty is alert and not convulsing, give 2 to 4 glasses of water to dilute the material. If spontaneous vomiting occurs, have casualty lean forward to avoid breathing in of emesis. Rinse mouth and administer more water. If breathing has stopped give artificial respiration. If breathing and pulse are absent give CPR. Get medical attention immediately.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation required.

Respiratory Protection:

Up to 2,000 ppm: NIOSH/MSHA approved organic vapour cartridge respirator or supplied-air respirator. Up to 3,100 ppm: continuous-flow supplied-air respirator, or full face-piece chemical cartridge respirator, or powered air-purifying respirator with organic vapour cartridge. Higher or unknown concentrations, as in fire or spill conditions: positive pressure, full facepiece self-contained breathing apparatus, or positive pressure, full face-piece air-supplied respirator with an auxiliary positive pressure self-contained breathing apparatus.

Eye Protection: Chemical goggles and/or face shield.

Skin Protection:

Butyl rubber gloves. Other impervious protective clothing, apron, sleeves, coveralls, boots, as required to prevent contact.

Other Personal Protective Equipment:

Safety shower and eye bath located closed to chemical exposure area.

Handling Procedures and Equipment:

Extremely flammable material. Personnel working with this chemical must be thoroughly trained regarding its hazards, and its safe use. Ground and bond all equipment to prevent static charge accumulation. Use non-sparking tools. Post "No Smoking" signs. Use smallest amount possible for the purpose. Avoid generating vapour or mist. Do not use pressure to transfer liquid. Keep containers closed when not in use. Avoid all contact with eyes, skin or clothing.

Storage Requirements:

Store in suitable, labelled containers, in a cool, dry, well-ventilated area, out of direct sunlight and away from all sources of ignition and incompatible materials. Keep tightly closed when not in use. Protect from damage. Inspect regularly for signs of leaking or damage. Keep storage area clear of combustible materials. Ground and bond equipment and containers to prevent a static charge buildup. Use spark-resistant tools and avoid splash filling of containers.

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ENVIRONMENTAL PROTECTION DATA
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Leak and Spill Procedure:

Eliminate all sources of ignition. Evacuate area. Cleanup personnel must be thoroughly trained in the hazards of this chemical and must wear protective equipment and clothing sufficient to prevent inhalation of vapours or mists and contact with skin and eyes. Stop or reduce discharge if safe to do so. Contain spill with inert absorbent (sand, earth). Prevent from entering sewers or waterways. Recover product and collect contaminated soil for disposal. For small spills, contain by applying inert absorbent. Collect waste for disposal. Contaminated absorbent may pose the same hazards as the spilled product. Flush area of spill with running water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM DICHROMATE****0365****PRODUCT INFORMATION**

Chemical Name and Synonyms: Sodium dichromate; Sodium bichromate; Chromic acid, disodium salt

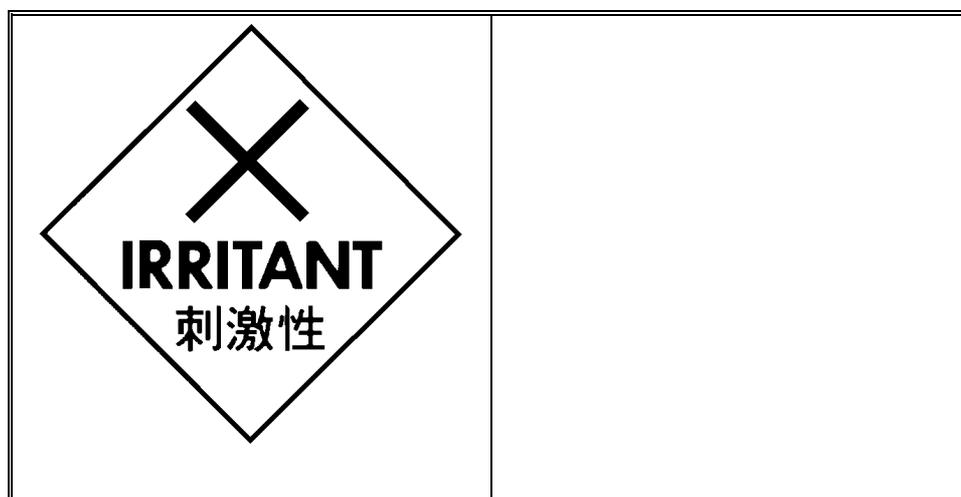
Chinese Name: 重鉻(VI)酸鈉

Chemical Family: Chromates

Chemical Formula: $\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$

Product Use: Laboratory reagent

CAS No.: 7789-12-0

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid

Odour and Appearance: Orange red crystals or granules, odourless

City University of Hong Kong

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Odour Threshold (ppm): Not applicable
Vapour Pressure (mm Hg): Not available
Vapour Density (Air=1): Not available
Evaporation Rate: Not available
Boiling Point (°C): 400°C (decomposes)
Melting Point (°C): 100°C
pH: 3.0-4.6 (depending on concentration of solution)
Specific Gravity: 2.3
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability:

Non flammable, but contact with other material may cause fire. Vigorously supports combustion.

Extinguishing Media:

Use water spray or fog, dry chemical, or carbon dioxide. Firefighters must wear protective equipment and clothing sufficient to prevent inhalation of dust or vapour and contact with skin and eyes.

Flash Point (Method Used): Not applicable

Autoignition Temperature: Not applicable

Upper Flammable Limit (% by volume): Not applicable

Lower Flammable Limit (% by volume): Not applicable

Hazardous Combustion Products: CrO_x, NaO_x

Sensitivity to Impact: Not available

Sensitivity to Static discharge: Not available

REACTIVITY DATA

Chemical Stability: Normally stable

Incompatibility with other substances:

Avoid contact with organic materials, oils, greases, reducing agents, alcohols, and oxidizing materials.

Becomes strongly oxidizing in strong acid solution.

Reactivity: Strong oxidizer. Keep away from combustible materials.

Hazardous Decomposition Products: Oxides of chromium (CrO₃), sodium (Na₂O).

HEALTH HAZARD DATA

Toxicological Data:

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

LD₅₀: (oral, rat) 51 mg/kg; (dermal, rabbit) 1,000 mg/kg

LC₅₀: (rat) 0.124 mg/mL/4h

Effects of Acute Exposure to Product:

Inhaled:

Can be destructive to upper respiratory tract tissue. Harmful. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi.

In contact with skin:

Extremely irritating to skin. Contact with broken skin may cause deep penetrating ulcers, "chrome sores". May cause sensitization by skin contact. May be absorbed by skin contributing to overall exposure.

In contact with eyes:

Overexposure will cause severe irritation and potential permanent damage to the eyes. Exposure to low concentrations may cause moderate irritation or conjunctivitis.

Ingested:

May be fatal as a result of ulceration of gastrointestinal tract, liver and kidney damage.

Effects of Chronic Exposure to Product:

Prolonged or repeated inhalation may cause ulceration and perforation of the nasal system. Prolonged or repeated exposure causes erosion and discolouration of the teeth, ulceration of skin ("chrome sores"), nephritis, epigastric pain, ulceration of the gastrointestinal tract. May cause allergic skin reaction.

Carcinogenicity: Confirmed human carcinogen (A1) (NTP)

Teratogenicity: No information available

Reproductive Effects: No information available

Mutagenicity: Mutagenic effects cited (RTECS No. HX7750000).

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

IMMEDIATELY flush eyes with plenty of water for at least twenty (20) minutes holding eyelids open while flushing. Washing eyes within one minute is essential to achieve maximum effectiveness. Get medical attention immediately.

Skin:

Remove contaminated clothing (including watches, rings, belts, and shoes). Immediately flush skin with plenty of water for at least twenty (20) minutes. Get medical attention immediately. Decontaminate clothing before reuse, or discard. Contaminated clothing (or any organic material) can become dangerously combustible when contaminated by this substance.

Inhalation:

Move to fresh air. Give oxygen for breathing difficulty. If breathing has stopped apply artificial respiration. Get medical attention immediately.

Ingestion:

If conscious, alert, and NOT convulsing, give several glasses of water to drink and induce vomiting by toughing finger to back of throat. Seek medical attention IMMEDIATELY. In cases of massive overexposure, death has been avoided by the early use of renal dialysis. Intravenous ascorbic acid has also been reported effective in preventing renal failure.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation required.

Respiratory Protection:

Dust mask. NIOSH/MSHA approved positive-pressure, full face-piece self-contained breathing apparatus, or full face-piece supplied-air respirator with auxiliary positive pressure self-contained breathing apparatus, for any detectable concentration.

Eye Protection: Chemical safety goggles.

Skin Protection:

Responder gloves. Other impervious protective clothing (sleeves, coveralls, boots) sufficient to prevent contact.

Other Personal Protective Equipment: Safety shower and eye wash located in work area.

Handling Procedures and Equipment:

Corrosive and toxic material. Workers using this material must be thoroughly trained in its hazards and its safe use. Keep away from all combustible materials and ignition sources. Use the smallest amount possible for the purpose. Avoid all contact and inhalation of dust or mist.

Storage Requirements:

Store in suitable, labelled containers, in a cool, dry, area out of direct sunlight and away from all ignition sources. Store away from combustible materials. Keep tightly closed.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Evacuate area. Cleanup personnel must wear protective equipment and clothing sufficient to prevent inhalation of dust or vapour and contact with skin and eyes. Cover with dry lime or soda ash and collect in appropriate containers for removal to approved chemical waste disposal area. Flush area with water, direct runoff to appropriate treatment container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Sodium Hypochlorite****0371****PRODUCT INFORMATION**

Product Name: Sodium Hypochlorite 6-7%

Chinese Name: 次氯酸鈉

Composition/Purity of Hazardous Ingredients: 6-7% Sodium Hypochlorite (Aqueous).

Synonym(s):

Liquid bleach, hypochlorous acid, sodium, salt, soda bleach liquor, javel water, chlorox, industrial bleach, sodium oxychloride.

CAS Registry Number: 681-52-9

Chemical Family: Hypochlorous acid salt.

Molecular Formula: Na-O-Cl

Structural Formula: Na OCl

RISK SYMBOL

City University of Hong Kong

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

PHYSICAL DATA

Boiling Point:

Unstable at temperatures over 40°C. Can decompose slowly to Na Cl and Na ClO₃ but can also decompose to Na OH and Cl₂ depending on ambient conditions.

Molecular Weight: 74.44

Melting Point/Freezing Point: -25°C.

Specific Gravity (Water=1): 1.185 @ 20°C.

Solubility in Water: 100%

pH: >12

Solubility in Other Liquids: Soluble in alcohol, glycol

Vapour Density (Air=1): 2.49

Vapour Pressure: 17.5 (Torr) @ 20°C.

% Volatiles: 100% (by volume)

Saturation Vapour Concentration: No data.

Evaporation Rate (Butyl Acetate = 1): No data.

Co-efficient of Water/Oil Distribution: No data.

FIRE AND EXPLOSION DATA

Flash Point and Method: Non flammable.

Lower Explosive Limit/Lower Flammable Limit (%):N/A

Upper Explosive Limit/Upper Flammable Limit (%):N/A

Autoignition Temperature: N/A

Extinguishing Media:

Sodium hypochlorite is non-flammable. Use any media to control surrounding fire. Use water spray to cool containers of sodium hypochlorite and to control vapour.

Special Fire Fighting Procedures:

In the event of a fire, use NIOSH approved full face piece, SCBA respirators and full body suits.

Combustion Products:

Although sodium hypochlorite does not burn, it easily decomposes to release chlorine and oxygen gases.

Hazardous Explosion Data

- Sensitivity to Impact: Aqueous sodium hypochlorite is not sensitive to impact.

- Sensitivity to Static Discharge: Aqueous sodium hypochlorite is not sensitive to static discharge.

REACTIVITY DATA

Chemical Stability:

Unstable - decomposes at room temperature to release toxic chlorine gas and or/oxygen.

Incompatibility:

The decomposition rate is enhanced by direct sunlight, temperature increase or contact with acids or other strong oxidizers such as amines, ammonium salts, oxidine, methanol, phenyl acetonitrile, cellulose, ethyleneimine, oxidizable metals. If it comes in contact with ammonia, it may form the explosive nitrogen trichloride or give off irritating chloramine vapours.

Hazardous Decomposition Products:

Toxic chlorine gas when in contact with acids and oxygen gas when in contact with metals.

Hazardous Polymerization: Will not occur.

Corrosiveness to Metals: Copper, zinc, nickel, tin, manganese, iron and aluminum.

HEALTH HAZARD DATA

EFFECTS OF SHORT-TERM (ACUTE EXPOSURE)

Inhalation

Excessive inhalation of vapours, mists or fumes may cause bronchial irritation, coughing, labored breathing, nausea and pulmonary edema.

Eye Contact:

May cause severe irritation and corneal damage resulting in blindness. In swimming pools, NaOCl in concentration to 1 ppm or less is not irritating to the eyes if the ambient pH is kept higher than 7.2. However, at a slightly lower pH, a sensation of smarting and stinging of the eyes and accompanying reddening of the eyes may occur.

Skin Contact: May cause severe irritation, burns and blisters.

Ingestion:

May cause burning in mouth and throat, severe pain, vomiting, diarrhea, lowered blood pressure and shock.

Toxicity:

Inhalation, rat LC₅₀ 293 ppm/1 hour. Undetermined { Inhalation, rat LC₅₀ >10, 500 ppm Concentration (31.900 ppm) { Oral, rat LD₅₀ 8.91 g/kg { Dermal, rabbit LD₅₀>10,000 mg/kg. Oral, rat LD₅₀ 5000 mg/kg
Note: There is some research that indicates that 12-14% sodium hypochlorite should be classified as a chronic dermal and oral toxin (CCOHS - Chem Info data base).

EFFECTS OF LONG-TERM (CHRONIC) EXPOSURE

Skin:

Prolonged or repeated skin contact with solutions containing as little as 4-6% NaOCl can cause allergic contact dermatitis. Excessive contact with concentrated solutions may cause blistering, burns or other tissue necrosis.

Ingestion/Inhalation:

There is 1 case of evidence that bronchial asthma was due to sodium hypochlorite. Inhalation or ingestion of excessive concentrations of NaOCl may result in burns in mouth and throat, damage to stomach, esophagus and small intestine, pain, shock and death.

Sensitizing Capability:

May cause allergic responses to skin and lungs in prolonged and repeated exposures. However, testing is not conclusive.

Carcinogenicity:

Low concentrations are not carcinogenic but some evidence exists that 10% solutions do have some effects. However, testing is not conclusive.

Mutagenicity: Data in not conclusive.

Teratogenicity:

High concentrations of NaOCl do have some reproductive effects in mice, but testing is not conclusive.

Synergistic Materials: None known.

Threshold Limited Values (TLVS): ACGIH

Time-Weighted Average(TLV-TWA): 1 mg (Cl)/m³ (0.3 ppm)

Short-Term Exposure Limit (TLV-STEL): 9 mg (Cl)/m³ (3 ppm)

FIRST AID MEASURES

Inhalation:

Take proper precautions to ensure your own safety before attempting rescue. Remove victim to fresh air. If breathing has stopped give A.R. If breathing is laboured, get qualified personnel to administer oxygen.

Eye Contact:

Immediately flush contaminated eye(s) for 20 minutes with lukewarm flowing water. Take care not to rinse contaminated water into the non-affected eye.

Skin Contact:

Flush contaminated area with running water

For 20 minutes. Ensure that sodium hypochlorite is not kept in close contact with skin by means of watch bands, belts, restrictive clothing, etc.

Ingestion:

If victim is conscious and not convulsing, rinse mouth and throat with water. Dilute stomach contents with 1-2 glasses of water. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration.

Special Equipment/Antidotes: None.

First Aid Comments: None.

PREVENTATIVE MEASURES

Respiratory Protection:

If the TLV is exceeded, a full face-piece chemical cartridge respirator may be worn (up to 100X TLV). If in excess of this, a SCBA must be used.

Respiratory Protection Guidelines: As above.

Eye/Face Protection: Chemical safety goggles and/or full face shield. Do not wear contact lenses.

Skin Protection:

Wear impervious protective clothing, ie. Hard hat, boots, gloves, apron or coveralls etc.

Resistance of Materials for Protective Clothing: Latex or nitrile materials.

Personal Protection Comments: Work areas should include an eyewash station and/or safety shower.

Storage:

Store in a cool, dry, well ventilated place away from incompatibles and direct sunlight. Vented containers should be used and kept closed when not in use. Long-term storage is impossible without decomposition.

Handling: Protect containers from damage and freezing.

Exposure Control: No comment.

Engineering Controls:

These are the desired controls either with adequate ventilation methods or personnel or process isolation.

ENVIRONMENTAL PROTECTION DATA

Spill and Leak Procedures:

Ventilate area and allow qualified personnel to stop or control the leak. For small spills, flush area with plenty of water and mop up. For large spills, dike the ingredient and transfer to appropriate salvage containers.

Disposal:

Sodium hypochlorite may be neutralized with sodium bisulphite, sodium sulphite or dilute hydrogen peroxide.

Material Safety Data Sheet

City University of Hong Kong

MSDS**FERRIC CHLORIDE****0376****PRODUCT INFORMATION**

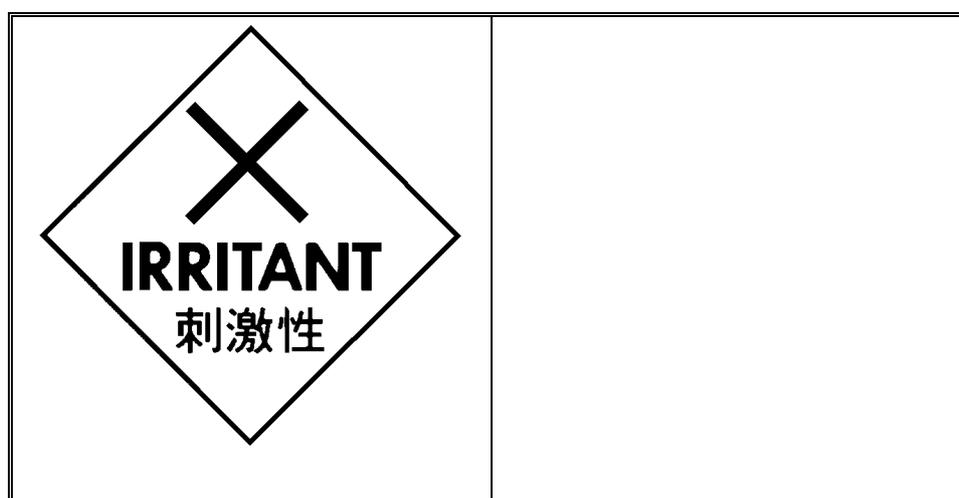
Chemical name(s) : FERRIC CHLORIDE

Chinese Name: 氯化鐵

Synonyms: Iron chloride hexahydrate; ferric trichloride hexahydrate

CAS No: 7705-08-0

Molecular Weight: 270.30

Chemical Formula: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ **RISK SYMBOL****PHYSICAL DATA**

Appearance: Yellow brown deliquescent crystals.

Boiling Point: No information found.

Odor: Slight odor of hydrochloric acid.

Melting Point: 37°C (99°F)

City University of Hong Kong

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Solubility: Soluble in water.
Vapor Density (Air=1): No information found.
Density: 2.90 @ 25°C/4°C
Vapor Pressure (mm Hg): 1.1 @ 194°C (381°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard. Irritating hydrogen chloride fumes may form in fire.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media:
Water, dry chemical, foam or carbon dioxide. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Emits toxic fumes of chloride when heated to decomposition.
Hazardous Polymerization: This substance does not polymerize.
Incompatibilities:
Metals, allyl chloride, sodium, potassium. Will react with water to produce toxic and corrosive fumes.

Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Danger! Corrosive. Causes burns to any area of contact. Harmful if swallowed or inhaled. Affects the liver.

Potential Health Effects

Inhalation:

Extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Ingestion:

Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach. Can cause sore throat, vomiting, diarrhea. Low toxicity in small quantities but larger doses (30 mg/kg) may cause nausea, vomiting and diarrhea. Pink urine discoloration is a strong indicator of iron poisoning. Liver damage, coma and death may follow, sometimes delayed as long as three days.

Skin Contact: Corrosive. Symptoms of redness, pain, and severe burn can occur.

Eye Contact: Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns.

Chronic Exposure:

Repeated ingestion may cause liver damage. Prolonged exposure of the eyes may cause discoloration.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-ACGIH Threshold Limit Value (TLV): 1 mg/m³ (TWA) soluble iron salt as Fe

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Maintain eye wash fountain and quick-drench facilities in work area. Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Isopropyl acetate****0377**

PRODUCT INFORMATION

Chemical name: Isopropyl acetate

Chinese Name: 異丙基醋酸酯

Synonyms:

Acetic acid, 1-methylethyl ester; isopropyl ethanoate; 1- methylethyl ethanoate; 2-propyl ethanoate; 2-propyl acetate; 2- acetoxypropane.

Chemical family: Ester

Formula: $\text{CH}_3\text{COOCH}(\text{CH}_3)_2$

Molecular weight: 102

CAS number: 108-21-4

CAS name: Acetic acid, 1-methylethyl ester

RISK SYMBOL



PHYSICAL DATA

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Boiling point (760 mm Hg): 88-90°C (190-194°F)
Freezing point: -69.3°C (-93°F)
Specific gravity (H₂O = 1 @ 20/20 °C): 0.8700
Vapor pressure (20°C): 47 mm Hg
Vapor density (Air = 1 @ 20°C): 3.5
Solubility in water (% by WT @ 20°C): 2.9
Percent volatiles by volume: 100
Evaporation rate (BuAc=1): 5.0
Appearance and odor: Clear, colorless, mobile liquid with strong fruity odor.

FIRE AND EXPLOSION DATA

Flammable limits in air, % by volume

Upper: 8.0

Lower: 1.8

Flash point (test method):

Tag open cup (ASTM D1310): 62°F (17°C)

Tag closed cup (ASTM D56): 40°F (4°C)

Extinguishing media:

Use CO₂ or dry chemical for small fires, alcohol-type aqueous film- forming foam or water spray for large fires.
Water may be ineffective but should be used to cool fire-exposed structures and vessels.

Special fire-fighting procedures:

*If potential for exposure to vapors or products of combustion exists, wear complete personal protective equipment, including self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive-pressure mode.

Unusual fire and explosion hazards:

Vapor is heavier than air and can travel considerable distance to a source of ignition and flashback. Material creates a special hazard because it floats on water.

REACTIVITY DATA

Stability: Stable

Hazardous polymerization: Will not occur.

Conditions to avoid: Heat, sparks, flame.

Materials to avoid:

Oxidizing agents such as hydrogen peroxide, nitric acid, perchloric acid or chromium trioxide.

Hazardous combustion or decomposition products: Carbon monoxide.

HEALTH HAZARD DATA

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Effects of exposure/toxicity data

Acute :

Ingestion (swallowing):

Can cause headache, drowsiness and unconsciousness. Slightly toxic to animals (oral LD₅₀, rats: 3 g/kg).

Inhalation (breathing):

Causes irritation of nasal passages and throat. High concentrations can cause stupor in animals. Practically non-toxic to animals (inhalation LC₅₀, rats, 4 hrs: 32,000 ppm).

Skin contact: Repeated or prolonged contact can cause drying of skin.

Eye contact:

Can produce severe eye injury which may require several days to heal. Vapor and liquid are irritating to the eyes.

Chronic:

Mutagenicity: In vitro, does not show mutagenic potential in Ames test. In vivo, no information.

Carcinogenicity: No information.

Reproduction: No information.

Medical conditions aggravated by exposure:

Significant exposure to this chemical may adversely affect people with chronic disease of the respiratory system, skin and/or eyes.

FIRST AID MEASURES

Ingestion (swallowing):

Induce vomiting of conscious patient immediately by giving two glasses of water and pressing finger down throat. Contact a physician immediately.

Inhalation (breathing):

Remove patient from contaminated area. If breathing has stopped, give artificial respiration, then oxygen if needed. Contact a physician immediately.

Skin contact:

Remove contaminated clothing and wash contaminated skin with large amounts of water. If irritation persists, contact a physician.

Eye contact:

Flush eyes with water for at least 15 minutes. Contact a physician immediately.

PREVENTATIVE MEASURES

*Respiratory protection:

Based on contamination level and working limits of the respirator, use a respirator approved by NIOSH/MSHA (the following are the minimum recommended equipment).

For isopropyl acetate concentrations of:

> or = 250 ppm and < or = 2000 ppm - Air-purifying respirator with full facepiece and organic vapor cartridge(s) or air-purifying full facepiece respirator with an organic vapor canister or a full facepiece powered air-purifying respirator fitted with organic vapor cartridge(s).

>2000 ppm and <16,000 ppm - Positive-pressure full facepiece supplied-air respirator, or continuous-flow full face-piece supplied-air respirator.

> or = 16,000 ppm or unknown concentration (such as in emergencies) - Positive-pressure self-contained breathing apparatus with full facepiece. Positive-pressure supplied-air respirator with full facepiece equipped with an auxiliary positive-pressure self-contained breathing apparatus escape system.

Ventilation:

Local exhaust: Recommended when appropriate to control employee exposure.

Mechanical (general): Not recommended as the sole means of controlling employee exposure.

Protective gloves: Neoprene or rubber.

Eye protection: Chemical safety goggles.

*Additional protective equipment:

For operations where spills or splashing can occur, use chemical protective clothing, including gloves and boots. A safety shower and eye bath should be readily available.

*Precautions to be taken in handling and storing:

Store in cool, well-ventilated area. Keep away from heat, sparks and flame. Keep containers closed when not in use. Always open containers slowly to allow any excess pressure to vent. Use only approved containers. Use spark-resistant tools. When transferring follow proper grounding procedures. Use with adequate ventilation. Avoid breathing vapor. Avoid contact with eyes, skin and clothing. Wash thoroughly with soap and water after handling. Decontaminate soiled clothing thoroughly before re-use. Discard contaminated leather clothing.

ENVIRONMENTAL PROTECTION DATA

*Steps to be taken if material is released or spilled:

Eliminate ignition sources. Avoid eye or skin contact; see "Special protection information" section for respirator information. Place leaking containers in well-ventilated area with spill containment. If fire potential exists, blanket spill with alcohol-type aqueous film-forming foam or use water spray to disperse vapors. Contain spill to facilitate clean-up. Clean-up methods may include absorbent materials, vacuum truck, etc. Avoid runoff into storm sewers and ditches which lead to natural waterways.

*Waste disposal method:

All notification, clean-up and disposal should be carried out in accordance with federal, provincial and local regulations. Preferred methods of waste disposal are incineration or biological treatment in federal/provincial approved facility.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD METAL****0378**

PRODUCT INFORMATION

Chemical name(s) : LEAD METAL

Chinese Name: 鉛

Synonyms: Granular lead, pigment metal; C.I. 77575

CAS No: 7439-92-1

Molecular Weight: 207.19

Chemical Formula: Pb

RISK SYMBOL

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PHYSICAL DATA

Appearance: Small, white to blue-gray metallic shot or granules.

Boiling Point: 1740°C (3164°F)

Odor: Odorless.

Melting Point: 327.5°C (622°F)

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Solubility: Insoluble in water.
Vapor Density (Air=1): No information found.
Density: 11.34
Vapor Pressure (mm Hg): 1.77 @ 1000°C (1832°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard. Powder/dust is flammable when heated or exposed to flame.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Can produce toxic lead fumes at elevated temperatures and also react with oxidizing materials.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Does not decompose but toxic lead or lead oxide fumes may form at elevated temperatures.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Ammonium nitrate, chlorine trifluoride, hydrogen peroxide, sodium azide, zirconium, disodium acetylide, sodium acetylide and oxidants.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Poison! Danger! May be fatal if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract.
Neurotoxin. Affects the gum tissue, central nervous system, kidneys, blood and reproductive system. Possible cancer hazard. May cause cancer based on animal data. Risk of cancer depends on duration and level of exposure.

Potential Health Effects

Inhalation:

Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.

Ingestion:

Poison! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:

Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation, redness and pain.

Eye Contact:

Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.

Chronic Exposure:

Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted.

Aggravation of Pre-existing Conditions:

Persons with pre-existing kidney, nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

For lead, metal and inorganic dusts and fumes, as Pb:

-OSHA Permissible Exposure Limit (PEL): 0.05 mg/m³ (TWA)

For lead, elemental and inorganic compounds, as Pb:

-ACGIH Threshold Limit Value (TLV): 0.05 mg/m³ (TWA), A3 animal carcinogen

ACGIH Biological Exposure Indices (BEI): 30 ug/100ml, notation B

For lead, inorganic: -NIOSH Recommended Exposure Limit (REL): 0.1 mg/m³ (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face high efficiency dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:

Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored.

See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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ENVIRONMENTAL PROTECTION DATA
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Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**Litmus****0379**

PRODUCT INFORMATION

Chemical name(s) : Litmus

Chinese Name: 石蕊

Synonyms: Lacmus, Lichenblue

CAS No: 1393-92-6

Molecular Weight: Not applicable.

Chemical Formula: Not applicable.

RISK SYMBOL

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PHYSICAL DATA

Appearance: Blue Powder.

Boiling Point: No information found.

Odor: No information found.

Melting Point: No information found.

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Solubility: Moderate (1-10%)
Vapor Density (Air=1): Not applicable.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): Not applicable.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not expected to be a fire hazard.
Explosion: None identified.
Fire Extinguishing Media: Water, dry chemical, foam or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: No information found.
Hazardous Polymerization: Will not occur.
Incompatibilities: No information found.
Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

Warning! Harmful if swallowed, inhaled or absorbed through skin. Causes irritation.

Potential Health Effects

Inhalation: Is harmful

Ingestion: May be irritant to the gastro-intestinal tract.

Skin Contact: Is irritating, May be absorbed through the skin with possible systemic effects.

Eye Contact: Is irritating.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

The above information is believed to be accurate to the best of our knowledge.
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If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

Note to Physician: This material is anticipated to have low toxicity. Treatment is symptomatic and supportive.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved): Not expected to require personal respirator usage.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:

There is insufficient data in the published literature to assign complete numerical SAF-T-DATA* ratings and laboratory protective equipment for this product. Special precautions must be used in storage, use and handling. Protective equipment for laboratory bench use should be chosen using professional judgement based on the size and type of reaction or test to be conducted and the available ventilation, with overriding consideration to minimize contact with the chemical.

Handling and Storage:

Keep container tightly closed. Suitable for any general chemical storage area. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Magnesium Carbonate, n-Hydrate****0380**

PRODUCT INFORMATION

Chemical name(s) : Magnesium Carbonate, n-Hydrate

Chinese Name: 碳酸鎂

Synonyms: Magnesium (II) Carbonate, Hydrate; Magnesium carbonate (1:1) hydrate

CAS No: 546-93-0 (USP: 23389-33-5).

Molecular Weight: Not applicable to mixtures.

Chemical Formula: $\text{MgCO}_3 \cdot n\text{H}_2\text{O}$

RISK SYMBOL

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PHYSICAL DATA

Appearance: White Powder.

Boiling Point: No information found.

Odor: Odorless.

Melting Point: No information found.

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Negligible (< 0.1%)
Vapor Density (Air=1): Not applicable.
Specific Gravity: 2.95
Vapor Pressure (mm Hg): Not applicable.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:
Stable under ordinary conditions of use and storage. Magnesium carbonate reacts with acids to liberate carbon dioxide.

Hazardous Decomposition Products: Forms magnesium oxide and carbon dioxide when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities: Formaldehyde.
Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Caution! May cause irritation to eyes and respiratory tract.
Potential Health Effects
Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.

Ingestion:
Magnesium carbonate is a food additive and non-toxic unless ingested in very large quantities. May cause diarrhea.

Skin Contact: No adverse effects expected. May cause mild irritation and redness.
Eye Contact: May cause irritation, redness and pain.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 15 mg/m³ total dust, 5 mg/m³ respirable fraction for nuisance dusts.
- ACGIH Threshold Limit Value (TLV):
10 mg/m³ total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**Manganese****0381**

PRODUCT INFORMATION

Chemical Name and Synonyms: Manganese, metal

Chinese Name: 錳

Chemical Family: Metal

Chemical Formula: Mn

Product Use: Laboratory reagent

CAS No.: 7439-96-5

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Odour and Appearance: Metallic-grey chunks or black, shiny powder, odourless

Odour Threshold (ppm): Not applicable

Vapour Pressure (mm Hg): ~0

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Vapour Density (Air = 1): Not applicable
Evaporation Rate: Not applicable
Boiling Point (°C): 1962°C
Melting Point (°C): 1244°C
pH: Not applicable
Specific Gravity: 0.72 @ 20°C
Coefficient of Water/Oil distribution: Not applicable

FIRE AND EXPLOSION DATA

Flammability:

Solid not combustible. Dust or powder is flammable in contact with an ignition source. Dust can form explosive mixtures with air.

Extinguishing Media:

Dry chemical powder, class D extinguisher, dry sand. Water may be used as a spray or fog, liberally applied.

Flash Point (Method Used): Not available

Autoignition Temperature: Not available

Upper Flammable Limit (% by volume): Not available

Lower Flammable Limit (% by volume): Not available

Hazardous Combustion Products: Emits toxic fumes under fire conditions.

Sensitivity to Impact: None

Sensitivity to Static discharge: Dust may be ignited by static discharge

REACTIVITY DATA

Chemical Stability: Stable

Incompatibility with other substances:

May react vigorously or violently with acids, bases, halogens, phosphorus, sulfur oxides. Reacts slowly with water, more rapidly with steam, and with acids or alkalis, to release flammable/explosive hydrogen gas. Reacts violently with halogenated products. As powder, can ignite spontaneously under certain conditions.

Reactivity: Avoid generation of dust, all ignition sources, and incompatible materials.

Hazardous Decomposition Products: Flammable/explosive hydrogen gas.

HEALTH HAZARD DATA

Toxicological Data:

LD₅₀: (oral, rat) 9 gm/kg

LC₅₀: Not available

Effects of Acute Exposure to Product:

Inhaled:

May cause irritation, shortness of breath, coughing. Inhalation of high concentrations can cause metal fume fever with flu-like symptoms of headache, drowsiness, weakness.

In contact with skin: Mechanical irritation

In contact with eyes: Mechanical irritation. May cause mild abrasion.

Ingested: Harmful. See Inhaled

Effects of Chronic Exposure to Product:

Chronic manganese poisoning involves the central nervous system with languor, sleepiness, weakness in the legs, a spastic gait and tendency to fall, mask-like appearance of the face, and emotional disturbances such as uncontrollable laughter.

Carcinogenicity: Not listed as a carcinogen by NTP, IARC, OSHA.

Teratogenicity: Prolonged oral administration to rats produced fetotoxicity.

Reproductive Effects: Men exposed to manganese dust showed decreased fertility (RTECS No. OO9275000).

Mutagenicity: Prolonged oral administration to rats produced mutagenic effects.

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

Immediately flush eyes with running water for at least twenty (20) minutes, holding eyelids open during flushing. If irritation persists, obtain medical attention.

Skin:

Remove contaminated clothing. Wash affected areas with soap and plenty of running water. If irritation persists, obtain medical advice.

Inhalation: Move victim to fresh air. Give oxygen and get medical attention for any breathing difficulty.

Ingestion:

If victim is alert and not convulsing, give 1 to 2 glasses of water to dilute material and induce vomiting. Have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust recommended.

Respiratory Protection:

Dust mask. Up to 10 mg/m³ (dust, not fume): NIOSH/MSHA approved dust and mist respirator. Up to 25 mg/m³ (dust, not fume): continuous-flow supplied-air respirator. Up to 50 mg/m³: full face-piece respirator with high-efficiency particulate filters, or continuous-flow or powered supplied-air respirator with tight-fitting face-piece. Up to 500 mg/m³: positive-pressure supplied-air respirator. For higher or unknown concentrations, as in fire or spill conditions, positive pressure, full face-piece self-contained breathing apparatus, or positive pressure, full face-piece supplied-air respirator, with an auxiliary positive pressure self-contained breathing apparatus.

Eye Protection: Chemical safety goggles

Skin Protection: Rubber or plastic gloves. Other protective clothing, labcoat, sleeves sufficient to limit contact

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Storage Requirements:

Store in suitable, labelled containers, in a cool, dry, well-ventilated area, out of direct sunlight and away from incompatible materials. Keep away from water, and isolate from air. Keep containers tightly closed when not in use and when empty. Empty containers may contain hazardous residues, treat with caution. Store under nitrogen in suitable, labelled containers, in a cool, dry, well-ventilated area, out of direct sunlight and away from incompatible materials. Keep containers tightly closed when not in use and when empty. Protect from damage.

Handling Procedures and Equipment:

Workers using this material must be thoroughly trained in its hazards and its safe use. Bond and ground containers and equipment in any process capable of generating dust or static electricity. Use non-sparking tools. Avoid generating dust. Use the smallest amount possible for the purpose in an area that is well-ventilated. Avoid inhaling dust.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Eliminate ignition sources if dust is present. Cleanup personnel must be thoroughly trained in the hazards of this material and its safe handling, and must wear protective equipment and clothing sufficient to prevent inhalation of dust or fumes, and contact with skin and eyes. Use non-sparking tools. Gather up in a manner that does not raise dust. Recycle if possible. Transfer what cannot be recycled into container and arrange removal by disposal company. After thorough clean up, wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Metaphosphoric Acid****0382**

PRODUCT INFORMATION

Chemical Name: Metaphosphoric Acid

Chinese Name: 偏磷酸

Synonym: Phosphoric acid, glacial. Phosphoric acid, meta

Chemical Family: Not available.

CAS: Mixture.

Chemical Formula :Not applicable.

Material Uses: Not available.

RISK SYMBOL

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PHYSICAL DATA

Physical State and Appearance: Solid. (Deliquescent crystals solid.)

Odor: Odorless.

Taste: Not available.

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The above information is believed to be accurate to the best of our knowledge.
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Molecular Weight: Not applicable.
pH (1% soln/water): 1.5 [Acidic.]
Color : Clear Colorless.
Boiling Point: Not available.
Melting Point: Not available.
Critical Temperature: Not available.
Specific Gravity: 2.2 (Water = 1)
Vapor Pressure: Not applicable.
Vapor Density: >1 (Air = 1)
Volatility: Not available.
Odor Threshold: Not available.
Evaporation rate: Not available.
Viscosity : Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.
Dispersion Properties: See solubility in water.
Solubility: Soluble in cold water, hot water.

FIRE AND EXPLOSION DATA

The Product is: May be combustible at high temperature.
Auto-Ignition Temperature: Not available.
Flash Points: Not available.
Flammable Limits: Not available.
Products of Combustion: Not available.
Fire Hazards in Presence of Various Substances: Not available.
Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet.

Special Remarks on Fire Hazards: If reacting with metals, it releases hydrogen, a flammable and explosive hazard.
Special Remarks on Explosion Hazards: Not available.

REACTIVITY DATA

Stability: The product is stable.
Instability Temperature: Not available.
Conditions of Instability:
Avoid elevated temperatures: will sublime at red heat. If melted or dissolved in water, will attack most metals. Avoid metallic oxides, carbonates, sulfides and cyanides.

Incompatibility with various substances: Reactive with alkalis.
Corrosivity: Not available.

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Special Remarks on Reactivity : Not available.

Special Remarks on Corrosivity: Not available.
Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Potential Acute Health Effects:

Extremely hazardous in case of skin contact (corrosive, irritant), of eye contact (irritant, corrosive), of ingestion. Very hazardous in case of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

The substance may be toxic to lungs. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

FIRST AID MEASURES

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. COLD water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. COLD water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Hazardous Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Hazardous Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion

DO NOT induce vomiting. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Hazardous Ingestion: Not available.

PREVENTATIVE MEASURES

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Precautions:

Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

ENVIRONMENTAL PROTECTION DATA

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive solid. Stop leak if without risk. DO NOT get water inside container. DO NOT touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all sources of ignition. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHYLENE BLUE****0383**

PRODUCT INFORMATION

Chemical name(s) : METHYLENE BLUE

Chinese Name: 亞甲<基>藍

Synonyms:

Basic Blue 9, trihydrate; Methylene blue trihydrate; 3,7-Bis(dimethylamino) phenazathionium chloride trihydrate

CAS No: 61-73-4

Molecular Weight: 373.91

Chemical Formula: $C_{16}H_{18}ClN_3S \cdot 3H_2O$

RISK SYMBOL



PHYSICAL DATA

Appearance: Dark green crystals with bronze luster or crystalline powder.

Boiling Point: Decomposes.

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The above information is believed to be accurate to the best of our knowledge.
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Odor: Odorless.
Melting Point: 100 - 110°C (212 - 230°F)
Solubility: Soluble in water.
Vapor Density (Air=1): 13
Specific Gravity: No information found.
Vapor Pressure (mm Hg): Not applicable.
pH: No information found
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Methylene blue does not burn. Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
May produce oxides of nitrogen, sulfur and carbon when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities:
Strong oxidizing agents, alkali, dichromates, alkali iodides, reducing agents.
Conditions to Avoid: Heat, flame, ignition sources, dusting and incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Warning! Harmful if swallowed.
Potential Health Effects: This material is relatively nonhazardous in routine industrial situations.
Inhalation:
No adverse health effects expected from inhalation. May cause a short period of rapid or difficult breathing.
Ingestion:
A burning sensation of the mouth may be noted following ingestion of methylene blue. May cause nausea, vomiting, diarrhea, and gastritis. Large doses may cause abdominal and chest pain, headache, profuse sweating, mental confusion, painful micturation, and methemoglobinemia.
Skin Contact:
Not expected to be a health hazard from skin exposure. Methylene blue may color the skin a bluish color. May cause photosensitization.

Eye Contact: No adverse effects expected. May cause mechanical irritation.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

In general, dilution ventilation is a satisfactory health hazard control for this substance. However, if conditions of use create discomfort to the worker, a local exhaust system should be considered.

Personal Respirators (NIOSH Approved):

Not expected to require personal respirator usage. For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Avoid dust formation and control ignition sources. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**PHOSPHORUS TRICHLORIDE****0384**

PRODUCT INFORMATION

Chemical name(s) : PHOSPHORUS TRICHLORIDE
Chinese Name: 三氯化磷
Synonyms: Phosphorus Chloride; Chloride of Phosphorus
CAS No: 7719-12-2
Molecular Weight: 137.32
Chemical Formula: PCl_3

RISK SYMBOL



PHYSICAL DATA

Appearance: Colorless, fuming liquid.
Boiling Point: 75.3°C (167°F)
Odor: Pungent, irritating odor.
Melting Point: -111.8°C (-170°F)

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Solubility: Decomposes exothermically in water.
Vapor Density (Air=1): 4.75
Specific Gravity: 1.57 @ 21°C
Vapor Pressure (mm Hg): 100 @ 21°C (70°F)
pH: No information found.
Evaporation Rate (BuAc=1): > 1
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Non-flammable but reacts exothermically with water and may produce flashes of fire. Substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Dry chemical, foam or carbon dioxide. Do not use water.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. In contact with water, may be an ignition source. Reacts with water to produce hydrochloric acid and phosphoric acid. The reaction may lead to flash fires due to the spontaneous ignition of diphosphine. Hydrochloric and phosphoric acid will react with most common metals except nickel and lead, to form flammable and potentially explosive hydrogen gas.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Hydrogen chloride, hydrochloric and phosphorous acids at high temperatures or in contact with water. Thermal decomposition products may also include phosphine and diphosphine.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Water, potassium or sodium metal, strong oxidants, hydroxylamine, nitric acid, alcohols, fluorine and lead oxide. Phosphorous trichloride is corrosive to most common construction materials, especially if moisture is present. (Steel corrosion at 0.5 - 3 mils per year would be expected).

Conditions to Avoid: Moisture and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Danger! Corrosive. May be fatal if swallowed or inhaled. Causes burns to any area of contact. May cause delayed lung injury. Water reactive. Contact with water or moist air liberates corrosive hydrochloric and phosphoric acid and may cause flash fires. Strong oxidizer. Contact with other material may cause fire.

Potential Health Effects

Inhalation:

Corrosive. Extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. Inhalation may be fatal as a result of spasm inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.

Ingestion:

Corrosive, causes severe burns. Forms hydrochloric and phosphorous acids by hydrolysis. Symptoms include abdominal pain, vomiting, diarrhea. Aspiration of the swallowed product or vomitus can cause severe pulmonary complications. Ingestion may be fatal.

Skin Contact:

Corrosive, causes severe burns. Local pain, redness, and possible acid burns on acute or prolonged contact. Vapors can cause irritation, as seen by redness and swelling.

Eye Contact:

Corrosive, causes severe burns. Vapors can cause pain, redness, and blurred vision. Irreversible eye damage can occur from vapors and liquid splashes.

Chronic Exposure:

Chronic ingestion or inhalation may induce systemic phosphorous poisoning. Liver damage, kidney damage, jaw/tooth abnormalities, blood disorders and cardiovascular effects can result.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, jaw/tooth abnormalities, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 0.5 ppm (TWA)
- ACGIH Threshold Limit Value (TLV): 0.2 ppm (TWA), 0.5 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airtight hood, or full-facepiece self-contained breathing apparatus. This substance has unknown warning properties.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage and moisture. Isolate from any source of heat or ignition. Avoid storage on wood floors. Separate from incompatibles, combustibles, organic or other readily oxidizable materials. Isolate from incompatible substances. Keep away from water. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate the area of the leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapors. Keep out of sewers and surface waters. Contain spill and collect if possible. Arrange with supplier to ship back recovered material for reclamation. If recovery is not possible, cover spill with dry sand. Cover this with excess soda ash/slaked lime (1:1 mix). Cautiously spray with a small amount of water (exothermic reaction), then saturate with water and mix. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM FLUORIDE****0385****PRODUCT INFORMATION**

Chemical name(s) : POTASSIUM FLUORIDE

Chinese Name: 氟化鉀

Synonyms: None

CAS No: 7789-23-3 (Anhydrous)

Molecular Weight: 94.14

Chemical Formula: KF 2H₂O**RISK SYMBOL****PHYSICAL DATA**

Appearance: Colorless crystals.

Boiling Point: 156°C (313°F)

Odor: Odorless.

Melting Point: 41°C (106°F)

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Solubility: 349g/100cc water @ 18°C (64°F).
Vapor Density (Air=1): No information found.
Specific Gravity: 2.45
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Water spray will also reduce fumes and irritant gases.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Attracts moisture from the air.
Hazardous Decomposition Products: Burning may produce hydrogen fluoride vapors.
Hazardous Polymerization: Will not occur.
Incompatibilities:
Platinum plus bromine trifluoride; reacts with strong acids to form hydrogen fluoride. Corrodes glass and porcelain.
Conditions to Avoid: Moisture and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Danger! May be fatal if swallowed or inhaled. Affects respiratory system, heart, skeleton, circulatory system, central nervous system and kidneys. Causes irritation and burns to skin, eyes and respiratory tract. Irritation and burn effects may be delayed. Harmful if absorbed through skin.

Potential Health Effects

There is limited information available on the hazards of this chemical. It is assumed that it will behave similarly to other soluble fluoride salts. If inhaled or swallowed, this compound can cause fluoride poisoning. Early symptoms include nausea, vomiting, diarrhea, and weakness. Later effects include central nervous system effects, cardiovascular effects and death.

Inhalation:

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May cause irritation and burns to the respiratory tract, symptoms may include coughing, sore throat, and labored breathing. May be absorbed through inhalation of dust; symptoms may parallel those from ingestion exposure. Irritation and burning effects may not appear immediately.

Ingestion:

May cause salivation, nausea, vomiting, diarrhea, and abdominal pain, followed by weakness, tremors, shallow respiration, cardopedal spasm, convulsions, and coma. May cause brain and kidney damage. Death may be caused by respiratory paralysis. Affects heart and circulatory system.

Skin Contact:

Causes severe irritation and possibly burns to the skin. May be absorbed through the skin. Effects may not appear immediately.

Eye Contact:

Causes irritation. May be extremely irritating with possible burns to eye tissue and permanent eye damage may result.

Chronic Exposure:

Chronic exposure may cause mottling of teeth and bone damage (osteosclerosis) and fluorosis. Symptoms of fluorosis include brittle bones, weight loss, anemia, calcified ligaments, general ill health and joint stiffness.

Aggravation of Pre-existing Conditions:

Populations that appear to be at increased risk from the effects of fluoride are individuals that suffer from diabetes insipidus or some forms of renal impairment.

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FIRST AID MEASURES
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First aid procedures should be pre-planned for fluoride compound emergencies. Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.

Ingestion:

Administer milk, chewable calcium carbonate tablets or milk of magnesia. Never give anything by mouth to an unconscious person. CALL A PHYSICIAN IMMEDIATELY.

Skin Contact:

Wipe off any excess material from skin and then immediately flush skin with large amounts of soapy water. Remove contaminated clothing and shoes. Wash clothing before re-use. Apply bandages soaked in magnesium sulfate. CALL A PHYSICIAN IMMEDIATELY.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

For large exposures, systemic effects (hypocalcemia and hypomagnesia) may occur.

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PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 2.5 mg (F)/m³ (TWA)
- ACGIH Threshold Limit Value (TLV): 2.5 mg (F)/m³ (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from acids and alkalis.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Schiff Reagent****0386****PRODUCT INFORMATION**

Chemical name(s) : Schiff Reagent

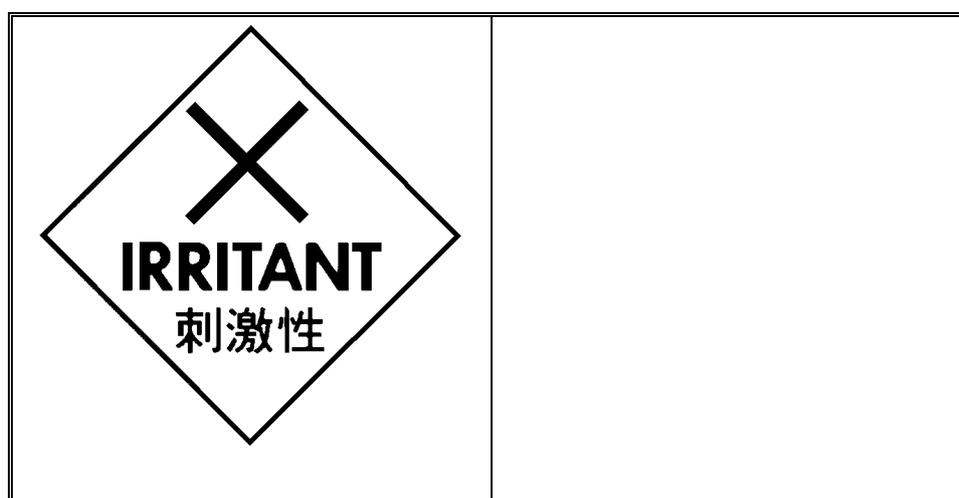
Chinese Name: 席夫試劑

Synonyms: Schiff's Reagent; Fuchsin-sulfite reagent

CAS No: Not applicable to mixtures.

Molecular Weight: Not applicable to mixtures.

Chemical Formula: Not applicable to mixtures.

RISK SYMBOL**PHYSICAL DATA**

Appearance: Clear, colorless liquid.

Boiling Point: ca. 100°C (ca. 212°F)

Odor: Pungent odor of sulfur dioxide.

Melting Point: ca. 0°C (ca. 32°F)

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Solubility: Complete (100%)
Vapor Density (Air=1): Not applicable.
Specific Gravity: 1.00
Vapor Pressure (mm Hg): Essentially the same as water.
pH: 1.1 - 1.5
Evaporation Rate (BuAc=1): Essentially the same as water.
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire: Not expected to be a fire hazard.

Explosion:

Contact of concentrated solutions with most metals causes formation of flammable and explosive hydrogen gas.

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Hydrogen chloride, oxides of sulfur, carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials, cyanides, sulfides, sulfites, and formaldehyde.

Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Danger! Corrosive. Liquid and mist cause severe burns to all body tissue. May be fatal if swallowed or inhaled.

Vapor irritating to eyes and respiratory tract. Inhalation may cause lung damage. May cause allergic respiratory reaction.

Potential Health Effects

Health hazards given on this data sheet apply to concentrated solutions of hydrochloric acid. Hazards of dilute solutions may be reduced, depending upon the concentration. Degree of hazard for these reduced concentrations is not currently addressed in the available literature.

Inhalation:

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Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. May cause allergic reaction in sensitive individuals.

Ingestion:

Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea, and in severe cases, death.

Skin Contact:

Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.

Eye Contact:

Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure:

Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance. Some individuals are said to be dangerously sensitive to minute amounts of sulfites in foods. Symptoms may include bronchi constriction, shock, gastrointestinal disturbances, Angio edema, flushing, and tingling sensations. Once allergy develops, future exposures can cause asthma attacks with shortness of breath, wheezing, and cough.

FIRST AID MEASURES

First aid procedures given apply to concentrated solutions. Exposures to dilute solutions may not require these extensive first aid procedures. Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): Hydrochloric acid 5 ppm (TWA) Ceiling.
- ACGIH Threshold Limit Value (TLV):Hydrochloric acid 5 ppm (TWA) Ceiling.
- Sodium bisulfite 5 mg/m³, A4, not classifiable as a human carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Product must be refrigerated at 2 - 8°C (36 - 46°F). When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Sodium perchlorate****0387**

PRODUCT INFORMATION

Chemical Name and Synonyms: Sodium perchlorate, anhydrous; Perchloric acid, sodium salt

Chinese Name: 高氯酸鈉

Chemical Family: Inorganic salt

Chemical Formula: NaClO₄

Product Use: Laboratory reagent

CAS No.: 7601-89-0

RISK SYMBOL



PHYSICAL DATA

Physical State: Solid

Odour and Appearance: White crystalline powder; odourless

Odour Threshold (ppm): Not applicable

Vapour Pressure (mm Hg): Not applicable

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Vapour Density (Air = 1): Not available
Evaporation Rate: Not available
Boiling Point (°C): Not available
Melting Point (°C): 482°C (decomposes)
pH: 6 to 8 (5% aqueous solution)
Specific Gravity: 2.5
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability:

Does not burn. Forms flammable, explosive or shock-sensitive mixtures with many materials, therefore is a serious fire and explosion risk.

Extinguishing Media:

Flooding quantities of water spray or fog. CO₂ may be effective for small fires; foam is not effective. Firefighters must wear protective equipment and clothing sufficient to prevent inhalation of fumes and contact with skin and eyes. Bunker Gear is not adequate. Approach from upwind direction. Remove all flammable and combustible materials from area. Use water to cool containers, and do not attempt to approach heated containers until they have cooled, and then wear protective equipment; decomposition products (chlorine, hydrogen chloride) are extremely hazardous to health.

Flash Point (Method Used): Not applicable

Autoignition Temperature: Not applicable

Upper Flammable Limit (% by volume): Not applicable

Lower Flammable Limit (% by volume): Not applicable

Hazardous Combustion Products: Chlorine, hydrogen chloride, sodium oxides

Sensitivity to Impact:

Pure product is relatively insensitive. Forms shock-sensitive mixtures with many substances.

Sensitivity to Static discharge: Probably not sensitive

REACTIVITY DATA

Chemical Stability:

Stable at normal temperatures, unless contaminated. Very hygroscopic; absorbs moisture from air and forms wet solid or solution.

Incompatibility with other substances:

Mixtures with combustible and flammable materials are highly explosive and may easily be ignited by friction, heat, sparks or shock. Forms friction and impact-sensitive explosive mixtures with finely powdered metals (e.g. Magnesium), strong reducing agents, (e.g. Calcium hydride, strontium hydride). Mixtures with organic material are more readily flammable and can be explosive if finely divided. May react violently or explosively with strong acids, alcohols, ammonium nitrate, hot charcoal. Mixtures with sulphur can explode on impact. Mixtures with hydrazine can explode with friction. Corrosive to steel and gray cast iron. Not corrosive to stainless steel, copper, bronze, copper-nickel alloy, aluminum, nickel and its alloys.

Reactivity:

Strong oxidizer; can undergo reactions ranging from vigorous to explosive when oxidizable materials are present. Decomposes, possibly violently or explosively, above 400°C, releasing toxic gases. Avoid heat, sparks, open flame.

Hazardous Decomposition Products: Toxic fumes of chlorine, hydrogen chloride

HEALTH HAZARD DATA

Toxicological Data:

LD₅₀: (oral, rat) 2,100 mg/kg; (ipr, mice) 551 mg/kg

LC₅₀: Not available

Effects of Acute Exposure to Product:

Inhaled:

Irritant to respiratory tract. May cause coughing and choking. Animal information indicates low toxicity by inhalation.

In contact with skin:

Does not appear to be irritating either as solid or concentrated solution (based on animal testing, no human information available). Not absorbed through skin to significant extent.

In contact with eyes:

Mechanical irritation, may cause tearing and temporary pain. Solutions or mists may cause severe irritation (animal testing).

Ingested:

No human information available. Animal testing indicates low oral toxicity. May cause methemoglobinemia (conversion of oxygen-carrying components of blood to an inactive form); symptoms are headache, and bluish discolouration of the lips and skin.

Effects of Chronic Exposure to Product:

Prolonged high-level exposure may affect the use of iodine by the thyroid gland, causing dysfunction such as goitre. These effects are not relevant to occupational exposure.

Carcinogenicity: No human or animal information available

Teratogenicity: No human or animal information available

Reproductive Effects: No human or animal information available

Mutagenicity: Not mutagenic in vitro tests.

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

Do not rub eyes. Allow eyes to tear naturally for a few minutes. Flush thoroughly with gently running water for five to ten (5 to 10) minutes, holding eyelids open while flushing. Get medical advice if irritation persists.

Skin:

Remove contaminated clothing (including shoes, belts, watchbands) under running water. Wash skin with running water for five to ten (5 to 10) minutes or until chemical is removed. If irritation persists, get medical attention. Keep clothing wet until decontamination is possible. Completely decontaminate clothing before reuse, or discard.

Inhalation: Remove to fresh air. Give oxygen or get medical attention for any breathing difficulty.

Ingestion:

If victim is alert and not convulsing, rinse mouth thoroughly and give 2 to 4 glasses of water to drink to dilute. Do not induce vomiting. Get medical attention immediately. If spontaneous vomiting occurs, rinse mouth thoroughly and give more water to drink.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation required

Respiratory Protection:

Dust/mist mask. NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus for high or unknown concentrations; full face-piece, positive pressure self-contained breathing apparatus for fire or spill conditions.

Eye Protection: Chemical safety goggles

Skin Protection:

Impervious gloves. Other protective clothing, apron, sleeves, coveralls, boots sufficient to prevent contact.

Other Personal Protective Equipment: Eye wash and safety shower in work area.

Handling Procedures and Equipment: All persons working with this material must be thoroughly trained in its hazards and its safe use. Keep away from materials that can burn, and from all incompatible materials (See Incompatibility with other substances). Use the smallest amount possible for the procedure. Avoid contamination. Keep work area free of any extraneous materials, and of all combustible materials. Avoid generating dust. Do not shock. Assume that empty containers contain hazardous residues and treat with appropriate caution. Never reuse containers, even if they appear to be clean.

Storage Requirements:

Store in suitable, labelled containers, in a cool, dry, well-ventilated area, away from incompatible or combustible materials, and out of direct sunlight. Store away from ignition sources. Keep tightly closed. Protect from damage and from shock. Inspect frequently for signs of damage. Have appropriate fire extinguishers nearby. Use fire-resistant or non-combustible structural materials, lighting and ventilation systems in the storage area. Provide raised sills or trenches to contain or direct spill product. Treat empty containers with caution; they may contain hazardous residues.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Evacuate area. Eliminate all sources of ignition and all combustible materials. Cleanup personnel must be thoroughly trained in the hazards of this chemical, and must wear protective equipment and clothing sufficient to prevent inhalation of dusts or mists and contact with skin and eyes. Prevent from entering sewers or waterways. Cover with sand, earth or other non-combustible material, transfer carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Vanadium Pentoxide****0388****PRODUCT INFORMATION**

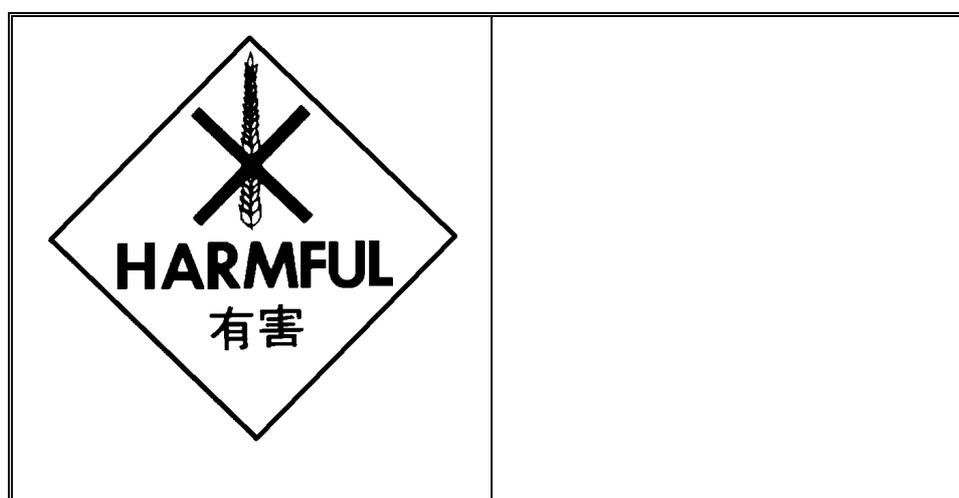
Chemical name(s) : Vanadium Pentoxide

Chinese Name: 五氧化二钒

Synonyms: Vanadium (V) Oxide; Vanadic Anhydride

CAS No: 1314-62-1

Molecular Weight: 181.88

Chemical Formula: V_2O_5 **RISK SYMBOL****PHYSICAL DATA**

Appearance: Yellow-brown crystalline solid.

Boiling Point: 1750°C (3182°F) Decomposes.

Odor: Odorless.

Melting Point: 690°C (1274°F)

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Solubility: Slight (0.1-1%)
Vapor Density (Air=1): 6.3
Specific Gravity: 3.36 @ 18°C/4°C
Vapor Pressure (mm Hg): 0 @ 20°C (68°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: May burn but will not ignite readily.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Oxides of vanadium.
Hazardous Polymerization: Will not occur.
Incompatibilities:
Lithium, peroxyformic acid, and chlorine trifluoride. Mixtures of vanadium pentoxide with calcium + sulfur + water may ignite spontaneously.

Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Poison! Danger! May be fatal if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract.

Potential Health Effects

Inhalation:

Highly Toxic fume, mist, dust. Exposure can injure the lungs and bronchial airways. Symptoms include irritation and inflammation of the mucous membranes, nasal passages and pharynx, a greenish-black discoloration of the tongue, persistent cough, shortness of breath, bronchiolar constriction, tightness in the chest. An asthma-like condition may occur. May result in pulmonary edema/pneumonia. May be fatal.

Ingestion:

Highly toxic. Ingestion may be fatal. Symptoms may include nausea, headache, and vomiting. Anemia may occur.

Skin Contact:

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Causes irritation to skin. Symptoms include redness, itching, and pain. May develop skin rash or lesions with intense itching.

Eye Contact:

Vapor, mist and dust cause irritation with sensation of burning, redness, pain, and signs of conjunctivitis.

Chronic Exposure:

Repeated or prolonged exposure may cause lung damage, respiratory tract sensitization or skin sensitization.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

Get medical attention immediately. Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

OSHA Permissible Exposure Limit (PEL):

Vanadium Respirable Dust, as V_2O_5 , 0.5 mg/m³ (Ceiling) Vanadium Fume, as V_2O_5 , 0.1 mg/m³ (Ceiling)

ACGIH Threshold Limit Value (TLV):

Vanadium Pentoxide, as V_2O_5 , respirable dust or fume, 0.05 mg/m³ (TWA), A4, Not classifiable as a human carcinogen

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the

contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ZINC OXIDE****0389**

PRODUCT INFORMATION

Chemical name(s) : ZINC OXIDE

Chinese Name: 氧化鋅

Synonyms: Chinese white; zinc white; flowers of zinc; calamine

CAS No: 1314-13-2

Molecular Weight: 81.38

Chemical Formula: ZnO

RISK SYMBOL

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PHYSICAL DATA

Appearance: White to yellowish-white amorphous powder.

Boiling Point: Sublimes.

Odor: Odorless.

Melting Point: 1975°C (3587°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Insoluble in water, alcohol; soluble in dilute acids.

Vapor Density (Air=1): No information found.

Specific Gravity: 5.67

Vapor Pressure (mm Hg): No information found.

pH: No information found.

Evaporation Rate (BuAc=1): No information found.

% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.

Explosion: Finely divided powder presents an explosion hazard.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Zinc oxide fume may be released when heated.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Absorbs carbon dioxide from air.

Hazardous Decomposition Products:

When heated to very high temperatures, zinc oxide sublimates to produce toxic fumes.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Has exploded when mixed with chlorinated rubber. Reacts violently with magnesium, linseed oil. Zinc oxide and magnesium can react explosively when heated.

Conditions to Avoid: Heat, incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Caution! May irritate respiratory tract.

Potential Health Effects

Inhalation:

May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath. Inhalation can cause a flu-like illness (metal fume fever). This 24- to 48-hour illness is characterized by chills, fever, aching muscles, dryness in the mouth and throat and headache.

Ingestion: Large oral doses may cause irritation to the gastrointestinal tract.

Skin Contact: Not expected to be a health hazard from skin exposure.

Eye Contact: Not expected to be a health hazard.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions:

Persons with a pre-existing heart condition or impaired respiratory function may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Not expected to require first aid measures. If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact:

Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Not expected to require first aid measures. Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

Zinc oxide:

-OSHA Permissible Exposure Limit (PEL):

fume: 5 mg/m³ (TWA)

respirable fraction: 5 mg/m³ (TWA)

total dusts: 15 mg/m³ (TWA)

-ACGIH Threshold Limit Value (TLV):

dusts: 10 mg/m³ (TWA), for inhalable (total) particulate matter containing no asbestos and < 1% crystalline silica.

fumes: 5 mg/m³ (TWA); 10 mg/m³ (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For

emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Clean-up personnel require protective clothing and respiratory protection from dust. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ARSENIC TRICHLORIDE****0390****PRODUCT INFORMATION**

CHEMICAL NAME: Arsenic Trichloride

Chinese Name: 三氯化砷

COMMON NAMES/SYNONYMS: Arsenic(III) Chloride

FORMULA: AsCl_3

CAS: 7784-34-1

RISK SYMBOL**PHYSICAL DATA**

Physical state (gas, liquid, solid) : Liquid

Vapor pressure at 23.5°C : 10 mmHg

Vapor density (Air = 1) : Not Available

Evaporation point : Not Available

Boiling point : 86.4 °F(30.2 °C)

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Freezing point : 16.7 °F (-8.5 °C)
pH : Not Available
Specific gravity (Water = 1.0) : 2.163
Oil/water partition coefficient : Not Available
Solubility (H₂O) : Decomposes
Odor threshold : Not Available
Odor and appearance : A colorless, oily liquid with an unpleasant odor.

FIRE AND EXPLOSION DATA

Conditions of Flammability: Non-flammable
Flash point: None
Method: Not Applicable
Autoignition Temperature: None
LEL(%): None UEL(%): None
Hazardous combustion products: Arsenic, hydrogen chloride
Sensitivity to mechanical shock: None
Sensitivity to static discharge: None
FIRE AND EXPLOSION HAZARDS: Emits highly toxic fumes under fire conditions.
EXTINGUISHING MEDIA:

Use media appropriate for surrounding fire. If water is necessary to fight fire, use with caution. Use of water will produce irritating and toxic vapors of arsenic trioxide and hydrogen chloride. Use appropriate control measures to protect against decomposition reaction and products. CO₂, dry chemical or other inert gas may be preferable.

FIRE FIGHTING INSTRUCTIONS:

Firefighters should wear full facepiece self contained breathing apparatus (SCBA) and full protective gear. Additional chemical protective clothing should be worn to prevent skin contact. Special personnel decontamination procedures are required. Consult HAZMAT specialist.

REACTIVITY DATA

STABILITY: Unstable when heated.
INCOMPATIBLE MATERIALS: Water, acids.
HAZARDOUS DECOMPOSITION PRODUCTS:
Decomposes with sunlight or on contact with water or moist air to produce arsenic trioxide and hydrogen chloride fumes.
HAZARDOUS POLYMERIZATION: Will not occur.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW:

Colorless oily liquid with unpleasant odor. Poison and corrosive. Inhalation and ingestion of small amounts can be fatal. May cause severe irritation and burns to the eyes, mucous membranes and skin. Inhalation may cause

pulmonary edema, respiratory damage, and systemic toxicity. Long-term exposure to inorganic arsenic compounds can increase the risks of developing cancer. Forms hydrogen chloride and arsenic trioxide on contact with moisture. Non-flammable.

Carcinogenicity: -- NTP: Yes IARC: Yes OSHA: Yes

EYE EFFECTS: Contact with the eyes causes severe irritation and can cause corrosive burns.

SKIN EFFECTS:

Contact with skin causes severe irritation and can cause corrosive burns. Skin damage may increase the amount of arsenic absorbed through the skin. Concentrations of fumes too low to cause irritation may cause skin rashes.

INGESTION EFFECTS:

Small amounts can be fatal if ingested. Ingestion may irritate or burn the mouth, throat, and stomach. Symptoms may include garlic breath, intense thirst, dehydration, nausea, and vomiting. Symptoms usually occur within 30 minutes but may be delayed for several hours if ingested with food.

INHALATION EFFECTS:

Highly toxic via inhalation. Inhalation causes severe irritation and may cause corrosive burns to the mucous membranes of the nose and throat as well as fluid retention and swelling in the lungs (edema). Symptoms may include irritation, cough and chest pain. Once arsenic is absorbed following acute poisoning, multi-organ failure can occur. The initial target organs are the gastrointestinal tract, brain and kidneys. Eventually, arsenic may damage the liver, bone marrow, nervous system and other organs.

CHRONIC:

Repeated inhalation of inorganic arsenic can increase the risks of developing cancer of the lungs, skin, and possibly liver. Long-term inhalation of arsenic compounds may adversely affect a variety of organs including the lungs, skin, liver, and nervous system.

SYMPTOMS:

Symptoms of long-term exposure to arsenic may include: chronic upper respiratory irritation and disease, hoarseness, weakness, anorexia, jaundice, gastrointestinal problems, incoordination, numbness and tingling of the hands and feet, mental confusion, and leukemia. Acute symptoms of arsenic poisoning may include irritation, nausea, vomiting, diarrhea, abdominal pain and acute hemolysis. A variety of symptoms may result from overexposure to inorganic arsenic. Symptoms may or may not include those listed above depending upon specific circumstances.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Exposure may aggravate a variety of conditions including pre-existing eye, skin, respiratory, and liver conditions.

FIRST AID MEASURES

EYES:

Persons with potential exposure to arsenic trichloride should not wear contact lenses. Flush contaminated eye(s) with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 30 minutes. Seek immediate medical attention.

SKIN:

Remove contaminated clothing as rapidly as possible. Flush affected skin with plenty of water. If contact has not resulted in skin damage, wash with soap and water. Seek immediate medical attention.

INGESTION:

If victim is conscious, rinse mouth and give 4-8 ounces of water or milk to dilute. DO NOT INDUCE VOMITING. Immediate medical attention is imperative. Call a physician or Poison Control Center at once.

INHALATION:

Prompt medical attention is mandatory in all cases of overexposure to arsenic trichloride. Rescue personnel should be equipped with self contained breathing apparatus. Regard anyone exposed to arsenic trichloride as having a potentially toxic dose. Move the victim to an uncontaminated atmosphere. Keep the victim warm, quiet and at rest. Provide assisted respiration if breathing has stopped. Administer oxygen if breathing is labored and when assisted respiration is given. Medical attention is imperative. Advise physician of the possible cause of the problem and that he must promptly inform himself (if not familiar with arsenic poisoning) of the toxic properties.

PREVENTATIVE MEASURES

ENGINEERING CONTROLS:

Use local exhaust ventilation in combination with enclosed processes as necessary to reduce concentrations to within current exposure limits.

EYE/FACE PROTECTION:

Vapor protective goggles with full-face shield or full facepiece SCBA operated in positive pressure mode.

SKIN PROTECTION:

Gloves, apron, shoe coverlets, etc. Or fully encapsulated vapor protective clothing of suitable material as necessary to prevent exposure. Consult manufacturers data for applicability.

RESPIRATORY PROTECTION:

A full-facepiece self-contained breathing apparatus operated in positive pressure mode should be available for emergency use.

OTHER/GENERAL PROTECTION:

Emergency eyewash stations and shower facilities should be located in close proximity to the work area.

Handling and Storage:

Store upright in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Separate from water, acids, and alkalis.

Use only in areas equipped with appropriate ventilation systems. Keep container tightly closed when not in use. Protect full and empty drums from physical damage and heat. Do not weld on or near full or empty containers. Do not re-use empty containers. Empty containers contain product residue, recycle and dispose of accordingly. Segregate full and empty drums. Use a "first in-first out" inventory system to prevent product from being stored for excessive periods of time. Do not drag, slide, or roll drums. Use a suitable hand truck, drum truck or other appropriate equipment.

Do not eat, drink, smoke, or apply cosmetics in areas where this product is used or stored. Do not store cigarettes, food or other personal items in storage and use areas. Wash hands and face thoroughly after handling and before meals and breaks. Change contaminated clothing promptly. Segregate contaminated clothing and launder appropriately. Shower at the end of the work shift.

Do not carry this product in an enclosed space such as a car trunk, van or station wagon. A leak can result in a toxic exposure.

ENVIRONMENTAL PROTECTION DATA

Immediately evacuate all personnel from affected area. Deny entry to unauthorized and unprotected individuals. Arsenic trichloride is highly toxic. Appropriate protective equipment is essential to prevent exposure. Absorb small spills with suitable inert sorbent material (i.e.: Vermiculite, etc.) And place in labeled, clean, dry, tightly closed container for later disposal. Dike well ahead of large spills. Use of water during clean-up may produce toxic gas. Consult HAZMAT specialist, the appropriate emergency telephone number listed in Section 1 and your closest BOC location. Collect and place in a sealed, labeled container for disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS BERYLLIUM SULFATE, 4-HYDRATE 0391

PRODUCT INFORMATION

Chemical Name(s) : Beryllium sulfate, 4-hydrate

Chinese Name: 硫酸鈹

Synonyms: Beryllium sulphate tetrahydrate; Sulfuric acid, beryllium salt (1:1), tetrahydrate

CAS No: 13510-49-1

Molecular Weight: 177.15

Chemical Formula: $\text{BeSO}_4 \cdot 4\text{H}_2\text{O}$

RISK SYMBOL



PHYSICAL DATA

Appearance: Colorless crystals.

Boiling Point: No information found.

Odor: No information found.

Melting Point: Decomposes on heating with water loss.

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Solubility: Soluble in water.
Vapor Density (Air=1): Not applicable.
Density: 1.713
Vapor Pressure (mm Hg): Not applicable.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic fumes of beryllium oxide and oxides of sulfur.

Hazardous Polymerization: Will not occur.
Incompatibilities: No information found.
Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

Warning! Harmful if swallowed, inhaled or absorbed through skin. Causes severe irritation to eyes, skin and respiratory tract. Cancer hazard. Can cause cancer. Risk of cancer depends on duration and level of exposure.

Potential Health Effects

Inhalation:

Inhalation can cause severe irritation of mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. Induces acute pneumonitis and pulmonary edema, with chest pain, bronchial spasm, fever, labored breathing. May cause clubbing of fingers. May cause lung damage and possibly death from heart failure. Inhalation of beryllium and beryllium compounds is associated with an increase risk of lung cancer.

Ingestion: Toxic! May cause systemic poisoning with symptoms paralleling those of inhalation.

Skin Contact:

Irritates the skin causing a rash, may cause skin ulceration. Contact with dust may cause acute dermatitis with burns.

Eye Contact: Causes irritation, itching, and burning. May cause eye damage.

Chronic Exposure:

Repeated or prolonged exposure may cause berylliosis, anorexia, weight loss, weakness, labored breathing, damage to the lungs, dermatitis, and skin ulcers. In severe cases, heart failure due to increased pulmonary resistance.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, or eye or cardiopulmonary diseases may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

For Beryllium and Beryllium Compounds:

- OSHA Permissible Exposure Limit (PEL) - 2 ug/m³ (TWA); 5ug/m³ (Ceiling); 25ug/m³, 30-min. (Maximum).
- ACGIH Threshold Limit Value (TLV) - 2 ug/m³ (TWA), A1 - Confirmed human carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face high efficiency dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency dust/mist respirator may be worn up to 50 times the

exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM NITRITE****0392**

PRODUCT INFORMATION

Chemical Name(S) : POTASSIUM NITRITE

Chinese Name: 亞硝酸鉀

Synonyms: Nitrous acid, potassium salt

CAS No: 7758-09-0

Molecular Weight: 85.10

Chemical Formula: KNO_2

RISK SYMBOL



PHYSICAL DATA

Appearance: White or slightly yellow granules.

Boiling Point: Not applicable.

Odor: Odorless.

Melting Point: 441°C (826°F) Unstable above 350°C (660°F)

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Solubility: 300g in 100g of water.
Vapor Density (Air=1): 2.9
Density: 1.92
Vapor Pressure (mm Hg): No information found.
pH: Alkaline
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

Explosion:

Strong oxidants may explode when shocked, or if exposed to heat, flame, or friction. Also may act as initiation source for dust or vapor explosions. Sealed containers may rupture when heated. Sensitive to mechanical impact.

Fire Extinguishing Media:

Dry chemical, carbon dioxide, Halon, water spray, or fog. If water is used, apply from as far a distance as possible. Water spray may be used to keep fire exposed containers cool. Do not allow water runoff to enter sewers or waterways.

Special Information:

Wear full protective clothing and breathing equipment for high-intensity fire or potential explosion conditions. This oxidizing material can increase the flammability of adjacent combustible materials.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Oxides of nitrogen and toxic metal fumes may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Reacts violently with many organic substances, inorganic reducing agents, metals, and boron, potassium amide, ammonium salts, and cyanides.

Conditions to Avoid: Heat, flame, ignition sources, shock and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

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Danger! Strong oxidizer. Contact with other material may cause fire. Harmful or fatal if swallowed. Harmful if inhaled or absorbed through skin. Causes severe irritation to eyes, skin and respiratory tract.

Potential Health Effects

Inhalation:

Inhalation of dust may cause irritation to the respiratory tract. Symptoms may include sneezing and coughing. High dust concentrations may produce toxic effects similar to those from ingestion exposure.

Ingestion:

May irritate the mouth, esophagus, stomach, etc. Excessive amounts effect the blood and blood vessels. Signs and symptoms of nitrite poisoning include intense cyanosis, nausea, dizziness, vomiting, collapse, spasms of abdominal pain, rapid heart beat, irregular breathing, coma, convulsions, and death due to circulatory collapse.

Skin Contact:

Causes irritation to skin. Symptoms include redness, itching, and pain. May cause burns to skin tissue upon contact.

Eye Contact: Causes irritation, redness, and pain. May cause burns.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions:

Persons with pre-existing blood disorders may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source,

preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage and moisture. Isolate from any source of heat or ignition. Avoid storage on wood floors. Separate from incompatibles, combustibles, organic or other readily oxidizable materials. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ACETAMIDE****0393****PRODUCT INFORMATION**

Product Name: Acetamide

Chinese Name: 乙酰胺

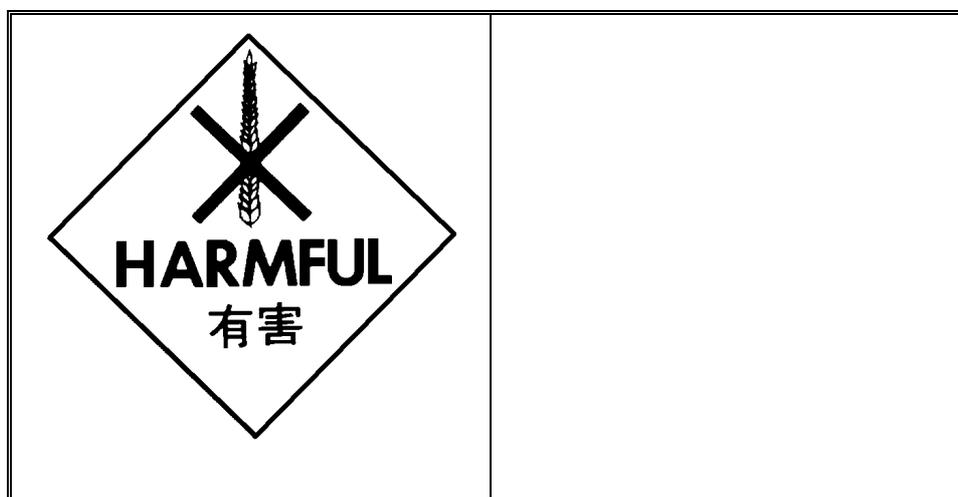
Common Synonyms: Acetic Acid Amide; Methanecarboxamide; Ethanamide

Chemical Family: Amides

Formula: CH_3CONH_2

Formula wt.: 59.07

CAS no.: 60-35-5

RISK SYMBOL**PHYSICAL DATA**Boiling Point: 222°C (431°F)
(At 760 mm Hg)

Melting Point: 81°C (177°F)

Vapor Pressure (mmHg): 1
(65°C)

Vapor Density (Air=1): N/A

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Carcinogenicity:

Some experiments with test animals indicated that this substance may be anticipated to be a carcinogen.

Reproductive Effects: None identified.

Effects Of Overexposure

Inhalation: Irritation of upper respiratory tract

Skin Contact: Irritation

Eye Contact: Irritation

Skin Absorption: None identified

Ingestion: None identified

Chronic Effects: None identified

Target Organs: None identified

Medical Conditions Generally Aggravated By Exposure: None identified

Primary Routes Of Entry: Inhalation, eye contact, skin contact

FIRST AID MEASURES

Ingestion: if swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Skin Contact: In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Ventilation: Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection:

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, butyl rubber gloves are recommended.

Storage Requirements : Keep container tightly closed. Suitable for any general chemical storage area.

ENVIRONMENTAL PROTECTION DATA

Steps To Be Taken In The Event Of A Spill Or Discharge:

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**L-ALANINE****0401**

PRODUCT INFORMATION

PRODUCT NAME(S): L-ALANINE

Chinese Name: 丙氨酸, 氨基丙酸

Synonyms: L-2 Aminopropanoic acid; alpha-aminopropanoic acid

CAS No: 56-41-7

Molecular Weight: 89.09

Chemical Formula: C₃H₇NO₂

RISK SYMBOL

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PHYSICAL DATA

Appearance: Colorless to white crystals or crystalline powder.

Boiling Point: 250°C (482°F) (sublimes)

Odor: Odorless.

Melting Point: 300°C (572°F) Decomposes.

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Soluble in water.
Vapor Density (Air=1): No information found.
Density: 1.4 @ 22°C
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire:

Not considered to be a fire hazard. As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Dry chemical, foam, water or carbon dioxide.

Special Information:

Use protective clothing and breathing equipment appropriate for the surrounding fire.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Burning may produce carbon monoxide, carbon dioxide, nitrogen oxides.

Hazardous Polymerization: Will not occur.

Incompatibilities: Oxidizers.

Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview:

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: No adverse health effects expected from inhalation.

Ingestion: No adverse effects expected. Large doses may cause gastro-intestinal upset.

Skin Contact: No adverse effects expected.

Eye Contact: No adverse effects expected but dust may cause mechanical irritation.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation:

Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Not expected to require first aid measures. If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact:

Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Not expected to require first aid measures. Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System: Not expected to require any special ventilation.

Personal Respirators (NIOSH Approved):

Not expected to require personal respirator usage. If necessary, use a dust mask.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Safety glasses. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage. Separate from oxidizing materials. Store in the dark. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

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MSDS

AMMONIA, ANHYDROUS

0402

PRODUCT INFORMATION

Chemical Name: AMMONIA ANHYDROUS

Chinese Name: 氨

Chemical Formula: NH_3

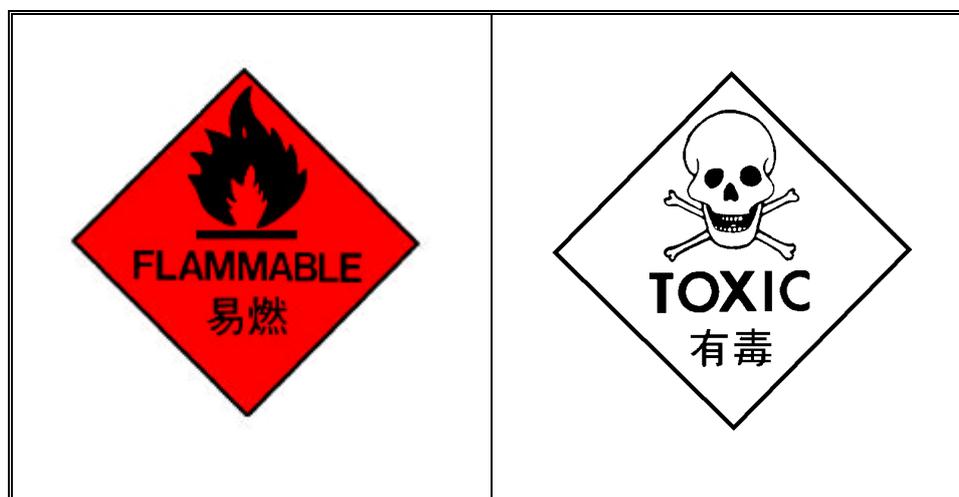
Molecular Weight: 17.03

Trade Name and Synonyms : AMMONIA, ANHYDROUS AMMONIA

Material Use: FERTILIZER, REFRIGERANT

C.A.S.: 7664-41-7

RISK SYMBOL



PHYSICAL DATA

Physical State: Liquid

Odour and Appearance : SHARP, IRRITATING/COLOURLESS

Odour Threshold (p.p.m.) : 1-5

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Specific Gravity : 0.682 @ 33.3°C
Vapour Pressure (mm): 6612 mm @ 20°C
Vapour Density (Air=1): 0.6 @ 0°C
Evaporation Rate: NOT APPLICABLE
Boiling Point (°C): -33.3°C
Freezing Point (°C): -77.7°C
Solubility in Water (20°C): 51 g/100 ml
pH: 14
Density (g/ml) : 0.682 @ -33.3°C
Coefficient of water/oil distribution NO AVAILABLE DATA

FIRE AND EXPLOSION DATA

Flammability: Yes

If yes, under which conditions?: Narrow range l.e.l.-16% u.e.l.-25%

Means of Extinction:

Where fire is involved use any fire fighting agent appropriate for surrounding material. Use water spray to cool fire exposed surface.

Special Procedures:

When using water, use fog nozzle only. Do not apply water directly to liquid spill. Water fog may be used to knock down vapours. Use S.C.B.A. And protective clothing. Contain spilled material to prevent it from entering water streams or sewers.

Flashpoint (°C) and Method: Not applicable

Upper explosion limit (% by volume): 25% in air

Lower explosion limit (% by volume): 16% in air

Auto Ignition Temperature (°C): 651

Hazardous Combustion Products: Burning ammonia gas may form NO_x

Sensitivity to Mechanical Impact: None

Sensitivity to Static Discharge: None

REACTIVITY DATA

Chemical Stability: Yes

Incompatibility with other substances: Yes

If so, which ones? :

Corrodes copper, tin, lead, brass, bronze and galvanized steel.

Reactivity and under what conditions:

Violent reaction when mixed with: acids, oxidizing agents, silver compounds, mercury, halogens, interhalogens, halides, ethylene oxide.

Hazardous Decomposition Products:

Burning ammonia gas may form NO_x (oxides of nitrogen)

HEALTH HAZARD DATA

Route of Entry: Skin Contact, Eye Contact, Inhalation Acute

Effects of Acute Exposure to Product:

Skin: Contact with liquid may cause chemical burns and frostbite

Eye: Slight irritation, tearing to severe irritation, swollen eyelids and blindness

Inhalation: Coughing, breathing difficulties, death due to suffocation or edema

Ingestion: No available data

Effects of Chronic Exposure to Product:

May cause long term irritation of eyes, nose and upper respiratory tract

LD₅₀ of Product (Specify Species and Route): Oral-rat: 0.35 g/kg

LC₅₀ of Product (Specify Species): Inhal. -rat: 4837 ppm/1 hr.

Irritancy of Product: Extreme

Sensitization of Product: No available data

Exposure limits of Product: T.L.V. - 25 ppm - 18 mg/m³

Synergistic materials: No available data

FIRST AID MEASURES

Skin:

Remove contaminated clothing and flush affected body area with warm water for at least 20 minutes. Seek medical attention immediately.

Eye:

Flush with warm water for 20 minutes, ensure a good flushing under eyelids. Seek medical attention immediately.

Inhalation:

Remove victim to fresh air and support breathing, use medical oxygen if available. If breathing has stopped, use rescue breathing. If heart beat is absent, commence cardiopulmonary resuscitation. Seek medical attention immediately.

Ingestion:

If victim is conscious and can swallow, give two glasses of water. Do not induce vomiting. Seek medical attention immediately.

PREVENTATIVE MEASURES

Gloves (Specify): Rubber/neoprene

Respiratory (Specify): Chem. Cart. (>300 ppm USE SCBA)

Eye (Specify): Chemical goggles

Footwear (Specify): Rubber/neoprene - high top

Clothing (Specify): Chemical resistant

Other (Specify): Use vapour proof suit if concentration >500 ppm

Engineering Controls (e.g. ventilation, enclosed process, specify): Use exhaust fans for enclosed area.

Handling Procedures and Equipment:

Use appropriate personal protective equipment. Mechanical equipment should be compatible with ammonia.

Storage Requirements:

Limit quantity of material in storage. Restrict access to storage area. Post appropriate warning signs. Keep storage area separate from populated work areas. Inspect periodically for deficiencies.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Contain liquid spill. Do not add water to liquid. Water fog may be used on vapour cloud.

Waste Disposal:

Liquid ammonia can be pumped into an appropriate tank. Contact the manufacturer and local government agency for disposal procedures.

Material Safety Data Sheet

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MSDS**AMMONIUM DICHROMATE****0403**

PRODUCT INFORMATION

PRODUCT NAME(S) : Ammonium Dichromate

Chinese Name: 重鉻(VI)酸銨

Synonyms: Dichromic acid, diammonium salt; ammonium bichromate

CAS No: 7789-09-5

Molecular Weight: 252.07

Chemical Formula: $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$

RISK SYMBOL



PHYSICAL DATA

Appearance: Bright, orange-red crystals.

Boiling Point: Not applicable.

Odor: Odorless.

Melting Point: 180°C (356°F) Decomposes.

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Solubility: 36.4 g/100 g water @ 20°C (68°F)
Vapor Density (Air=1): 8.7
Specific Gravity: 2.15
Vapor Pressure (mm Hg): No information found.
pH: 1% sol. = 3.95, 10% sol. = 3.45
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Autoignition temperature: 225°C (437°F) Combustible solid. Fire is possible at temperatures above decomposition 180°C (356°F) or by contact with an ignition source. Decomposition is self-sustaining above 225°C (437°F) with swelling, release of heat and nitrogen gas, and residue of green chromic oxide.

Explosion:

Contact with oxidizable substances may cause extremely violent combustion. Closed containers exposed to heat may explode.

Fire Extinguishing Media:

Use flooding amounts of water. Do not use dry chemical, carbon dioxide or Halon. Water spray may be used to keep fire exposed containers cool. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Closed containers readily rupture at decomposition temperature.

REACTIVITY DATA

Stability:

Stable under ordinary conditions of use and storage. Can react explosively when in contact with certain organic substances.

Hazardous Decomposition Products:

Burning may produce chrome oxides. Burning may produce ammonia, nitrogen oxides.

Hazardous Polymerization:

Will not occur. Ammonia released due to decomposition forms flammable mixtures in air between 16% and 25%.

Incompatibilities:

Reducing agents, combustibles, organic materials, strong acids, alcohols, ethylene glycol, carbide, hydrazine, potassium chlorate, sodium nitrite and water. Avoid readily oxidizable substances, such as paper, wood, sulfur, aluminum, plastics, etc.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview:

Danger! Strong oxidizer. Contact with other material may cause a fire. Corrosive. Causes severe burns to every area of contact. Harmful if swallowed or inhaled. Affects the respiratory system, liver, kidneys, eyes, skin and blood. May cause allergic reaction. Cancer hazard. Can cause cancer. Risk of cancer depends on duration and level of exposure.

Potential Health Effects:

Inhalation:

Corrosive. Extremely destructive to tissues of the mucous membranes and upper respiratory tract. May cause ulceration and perforation of the nasal septum. Symptoms may include sore throat, coughing, shortness of breath, and labored breathing. May produce pulmonary sensitization or allergic asthma. Higher exposures may cause pulmonary edema.

Ingestion:

Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. May cause violent gastroenteritis, peripheral vascular collapse, dizziness, intense thirst, muscle cramps, shock, coma, abnormal bleeding, fever, liver damage and acute renal failure.

Skin Contact:

Corrosive. Symptoms of redness, pain, and severe burn can occur. Dusts and strong solutions may cause severe irritation. Contact with broken skin may cause ulcers (chrome sores) and absorption, which may cause systemic poisoning, affecting kidney and liver functions. May cause skin sensitization.

Eye Contact:

Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. May cause corneal injury or blindness.

Chronic Exposure:

Repeated or prolonged exposure can cause ulceration and perforation of the nasal septum, respiratory irritation, liver and kidney damage and ulceration of the skin. Ulcerations at first may be painless, but may penetrate to the bone producing "chrome holes." Known to be a human carcinogen.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, asthma, allergies or known sensitization to chromic acid or chromates may be more susceptible to the effects of this material.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): For chromic acid and chromates, as $\text{CrO}_3 = 0.1 \text{ mg/m}^3$ (ceiling)
- ACGIH Threshold Limit Value (TLV):
For water-soluble Cr(VI) compounds, as $\text{Cr} = 0.05 \text{ mg/m}^3$ (TWA), A1 -confirmed human carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. (Natural rubber).

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a dry location separate from combustible, organic or other readily oxidizable materials. Avoid storage on wood floors. Remove and dispose of any spilled dichromates; do not return to original containers. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Only specially trained or qualified personnel should handle the emergency. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8.

Spills:

Clean up spills in a manner that does not disperse dust into the air. Pick up spill for recovery or disposal and place in a closed container. Keep away from paper and wood products. If wet, slowly reduce with ferrous sulfate and acid, neutralize and package residue for disposal. Do not return spilled material to original container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Ascorbic acid****0404**

PRODUCT INFORMATION

Synonyms: Ascorbic acid
Chinese Name: 抗壞血酸
CAS No: 50-81-7
Molecular Weight: 176.13
Chemical Formula: C₆H₈O₆

RISK SYMBOL

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PHYSICAL DATA

Appearance: White crystals.
Boiling Point: Not applicable.
Odor: Odorless.
Melting Point: 192°C (378°F) Slightly decomposes.

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Solubility: 33g/100g water.
Vapor Density (Air=1): No information found.
Density: 1.65
Vapor Pressure (mm Hg): No information found.
pH: 3 for 5mg/L aqueous solution; 2 for 50mg/L aqueous solution.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Stable under ordinary conditions of use and storage. Aqueous solutions are rapidly oxidized by air.

Hazardous Decomposition Products:

May produce acrid smoke and irritating fumes when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Strong oxidizers and alkali hydroxides, alkalis, iron, copper, sodium salicylate, sodium nitrite, theobromine and methenamine.

Conditions to Avoid: Air, light and incompatibles.

HEALTH HAZARD DATA

Emergency Overview:

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects:

Ascorbic acid is relatively non-hazardous in routine industrial situations. It is not expected to present significant health risks to the workers who use it.

Inhalation: May cause mild irritation to the respiratory tract.
Ingestion: Large oral doses may cause gastrointestinal disturbances.
Skin Contact: May cause mild irritation.
Eye Contact: May cause mild irritation.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if irritation persists.

Ingestion:

Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.

Skin Contact:

Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL):

15 mg/m³ total dust, 5 mg/m³ respirable fraction for nuisance dusts.

- ACGIH Threshold Limit Value (TLV):

10 mg/m³ total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:

In general, dilution ventilation is a satisfactory health hazard control for this substance. However, if conditions of use create discomfort to the worker, a local exhaust system should be considered.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Store in light-resistant containers. Isolate from any source of heat or ignition. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

Material Safety Data Sheet

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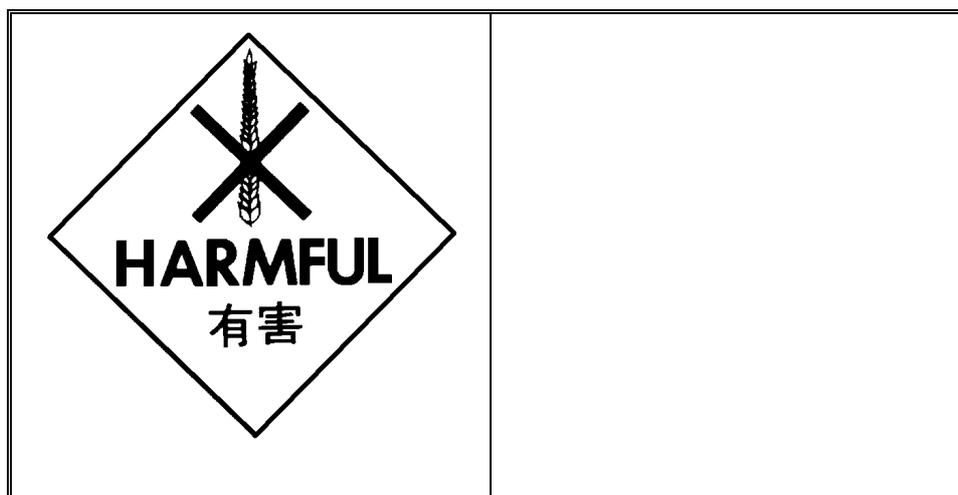
MSDS**BARIUM HYDROXIDE****0405****PRODUCT INFORMATION**

Chemical name and Synonyms: Barium hydroxide octahydrate; barium hydrate; barium hydroxide, 8-hydrate

Chinese Name: 氫氧化鋇

CAS No: 17194-00-2 (Anhydrous) 12230-71-6 (Octahydrate)

Molecular Weight: 315.47

Chemical Formula: $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ **RISK SYMBOL****PHYSICAL DATA**

Appearance: Colorless or white crystals.

Boiling Point: 780°C (1436°F)

Odor: Odorless.

Melting Point: 78°C (172°F)

Solubility: 5.6g/100g water @ 15C (59F).

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Vapor Density (Air=1): No information found.
Density: 2.18
Vapor Pressure (mm Hg): No information found.
pH: Aqueous solutions are strongly alkaline.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:
Stable under ordinary conditions of use and storage. Very alkaline. Rapidly absorbs carbon dioxide from air, becoming completely insoluble in water.

Hazardous Decomposition Products: No information found.
Hazardous Polymerization: Will not occur.
Incompatibilities: Acids, oxidizers, chlorinated rubber. Corrosive to metals such as zinc.
Conditions to Avoid: Air, dusting, and incompatibles.

HEALTH HAZARD DATA

Emergency Overview:
Danger! May be fatal if swallowed. Harmful if inhaled. Causes irritation to skin, eyes and respiratory tract. Affects muscles (including the heart), and central nervous system.

Potential Health Effects:

Inhalation:

Inhalation of dust cause irritation to the nose, throat, and respiratory tract. Symptoms include sore throat, coughing, and shortness of breath. Systemic poisoning may occur in sensitive individuals with symptoms similar to those of ingestion.

Ingestion:

A systemic poison that competes with potassium in the nervous system. Causes severe irritation of the gastrointestinal tract, tightness in the muscles of the face and neck, vomiting, diarrhea, abdominal pain, muscular tremors, anxiety, weakness, labored breathing, cardiac irregularity, convulsions, and death from cardiac and

respiratory failure. Estimated lethal dose lies between 1 to 15 grams. Death may occur within hours or up to a few days. May cause kidney damage.

Skin Contact: Solutions are strongly alkaline, highly irritating and may cause burns.

Eye Contact: Dusts cause eye irritation. Solutions may cause burns and damage.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin and nervous system disorders or impaired respiratory or kidney function may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

If swallowed, give large quantities of water to drink and get medical attention immediately. Never give anything by mouth to an unconscious person.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Treatment is symptomatic and supportive. Sodium sulfate can be given in case of ingestion to precipitate out the barium as barium sulfate.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

For Soluble Barium Compounds:

OSHA Permissible Exposure Limit (PEL): 0.5 mg (Ba)/m³

ACGIH Threshold Limit Value (TLV): 0.5 mg (Ba)/m³ A4 - not classifiable as a human carcinogen

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

Material Safety Data Sheet

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MSDS**BARIUM PEROXIDE****0406**

PRODUCT INFORMATION

Chemical name Synonyms: Barium dioxide; barium peroxide, barium superoxide, barium binoxide

Chinese Name: 過氧化鋇

CAS No: 1304-29-6

Molecular Weight: 169.34

Chemical Formula: BaO₂

RISK SYMBOL



PHYSICAL DATA

Appearance: Gray-white powder.

Boiling Point: 800°C (1472°F) Decomposes.

Odor: Odorless.

Melting Point: 450°C (842°F)

Solubility: Practically insoluble and decomposes in water.

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Vapor Density (Air=1): No information found.
Density: 4.96 @ 20°C (68°F)
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

Explosion:

Contact with oxidizable substances may cause extremely violent combustion. Sealed containers may rupture when heated.

Fire Extinguishing Media:

Use flooding amounts of water. Do not use dry chemical, carbon dioxide or Halon.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Do not release runoff from fire control methods to sewers or waterways. Water spray may be used to keep fire exposed containers cool.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Slowly decomposes in air.

Hazardous Decomposition Products: Emits oxygen and barium oxide when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Hydrogen sulfide, water, peroxy formic acid, magnesium plus zinc plus barium nitrate, powdered aluminum and magnesium, organic matter, and hydroxylamine. Reacts with water, acids and carbon dioxide in the presence of water to form hydrogen peroxide and large amounts of heat.

Conditions to Avoid: Heat, dusting, contact with combustibles and incompatibles. Moisture and air.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Emergency Overview

Danger! Strong oxidizer. Contact with other material may cause fire. May be fatal if swallowed. Harmful if inhaled. Causes irritation to skin, eyes and respiratory tract. Affects muscles (including the heart), and central nervous system.

Potential Health Effects

Inhalation:

May cause irritation to the nose, throat, and respiratory tract. Symptoms may include sore throat, coughing, and shortness of breath. Systemic poisoning may occur in sensitive individuals with symptoms similar to those of ingestion. Heavy exposure to dusts may produce a benign pneumoconiosis (baritosis). Systemic poisoning may occur with symptoms similar to those of ingestion. Heavy exposure to dusts can produce benign pneumoconiosis (baritosis).

Ingestion:

May cause tightness of the muscles of the face and neck, vomiting, diarrhea, abdominal pain, muscular tremors, anxiety, weakness, labored breathing, cardiac irregularity, convulsions, and death from cardiac and respiratory failure. Estimated lethal dose lies between 1 to 15 grams.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin and nervous system disorders or impaired respiratory or cardiac function may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Get medical attention immediately. Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Wash clothes before reuse. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

Note to Physician:

Monitor patients with significant ingestion for respiratory, cardiovascular, and blood pressure status. Watch for cardiac arrhythmias, respiratory failure due to flaccid paralysis of respiratory muscles, pulmonary edema, vocal

cord paralysis, severe hypertension, and late effect kidney failure. Acute barium poisoning results in hypokalemia. The administration of fluids containing dilute concentrations of potassium salts may be indicated.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

For Soluble Barium Compounds:

OSHA Permissible Exposure Limit (PEL): 0.5 mg (Ba)/m³

ACGIH Threshold Limit Value (TLV): 0.5 mg (Ba)/m³ A4 - not classifiable as a human carcinogen

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage and moisture. Separate from incompatibilities. Separate from combustibles, organic or other readily oxidizable materials. Avoid storage on wood floors. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BARIUM SULFATE****0407**

PRODUCT INFORMATION

Chemical name(s) : BARIUM SULFATE

Chinese Name: 硫(VI)酸鋇

Synonyms: Sulfuric acid, barium salt; barytes; blanc fixe; barite

CAS No: 7727-43-7

Molecular Weight: 233.39

Chemical Formula: BaSO₄

RISK SYMBOL

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PHYSICAL DATA

Appearance: Fine, white powder.

Boiling Point: 1600°C (2912°F) Decomposes.

Odor: Odorless.

Melting Point: 1580°C (2876°F)

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Solubility: Insoluble in water.
Vapor Density (Air=1): No information found.
Specific Gravity: 4.5 @ 15 (59°F)
Vapor Pressure (mm Hg): No information found.
pH: 5% in water is neutral to litmus.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Burning may produce sulfur oxides.
Hazardous Polymerization: Will not occur.
Incompatibilities: Aluminum, phosphorus.
Conditions to Avoid: Dusting and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: Not expected to be a health hazard.
Ingestion: Not expected to be a health hazard.
Skin Contact: No adverse effects expected.
Eye Contact: No adverse effects expected but dust may cause mechanical irritation.
Chronic Exposure:

Long term inhalation of dust may lead to deposition in lungs in sufficient quantities to produce baritosis - a benign pneumoconiosis. This produces a radiological picture even though symptoms and abnormal signs may not be present.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL): 15 mg/m³ total dust, 5 mg/m³ respirable dust

-ACGIH Threshold Limit Value (TLV): 10 mg/m³ total dust containing no asbestos and < 1% crystalline silica

Ventilation System:

In general, dilution ventilation is a satisfactory health hazard control for this substance. However, if conditions of use create discomfort to the worker, a local exhaust system should be considered.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**HYDROQUINONE****0408****PRODUCT INFORMATION**

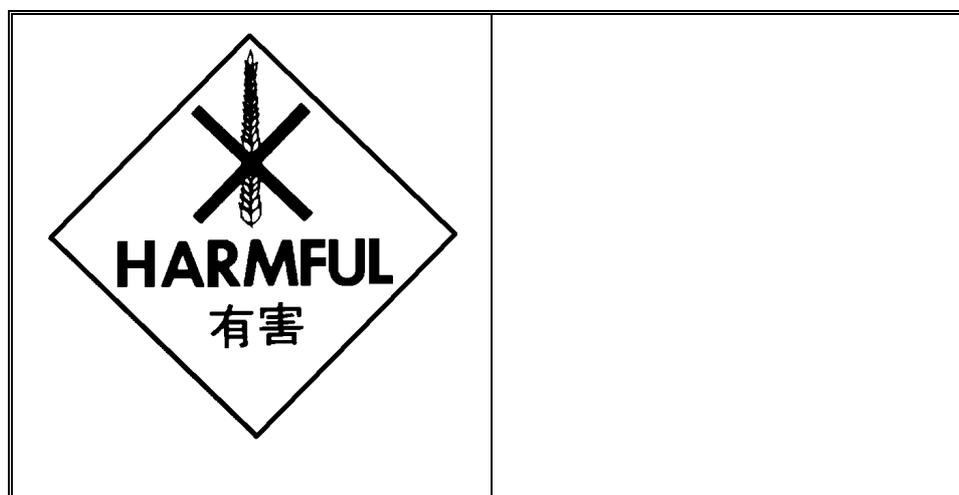
Chemical name and Synonyms:

1,4-Dihydroxybenzene; p-Dihydroxybenzene; 1,4-Benzenediol; Dihydroxybenzene; Quinol

Chinese Name: 醌醇 ; 二<氢>

CAS No: 123-31-9

Molecular Weight: 110.11

Chemical Formula: C₆H₄(OH)₂**RISK SYMBOL****PHYSICAL DATA**

Appearance: White crystals.

Boiling Point: 285°C (545°F)

Odor: Odorless.

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Melting Point: 170°C (338°F)
Solubility: 7g/100g water @ 25C (77°F).
Vapor Density (Air=1): 3.81
Specific Gravity: 1.33 @ 15°C
Vapor Pressure (mm Hg): 4 @ 150°C (302°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Flash point: 165°C (329°F) CC
Autoignition temperature: 516°C (961°F)
May pose a fire hazard when exposed to heat, flame, or oxidizing agents.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media:

Dry chemical, alcohol foam or carbon dioxide. Water or foam may cause frothing.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Stable under ordinary conditions of use and storage. Solution becomes brown in air due to oxidation.

Hazardous Decomposition Products:

Quinone and oxides of carbon may be formed when this material is heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Sodium hydroxide, strong alkalis, and oxidizers. Conditions to Avoid: Heat, flame, ignition sources, incompatibles, light, and air.

HEALTH HAZARD DATA

Emergency Overview:

Danger! May be fatal if swallowed. Affects central nervous system. Causes severe skin and eye irritation. Harmful if inhaled. May cause allergic skin reaction. Causes irritation to respiratory tract.

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Potential Health Effects

Inhalation:

Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Systemic effects have not been proven by this route.

Ingestion:

Highly toxic. May cause hyperactivity, stupor, fall in blood pressure, hyperpnea, abdominal pain, diarrhea, intense thirst, sweating, tinnitus, nausea, dizziness, a sensation of suffocation, an increased rate of respiration, vomiting, pallor, muscular twitching, headache, cyanosis, delirium, and collapse (from respiratory failure). Estimated lethal dose lies between 5 to 12 grams (usually because of respiratory failure from methemoglobin formation which leaves the blood unable to carry oxygen). May cause green to brownish-green urine.

Skin Contact: Causes severe irritation, redness and pain. Alkaline solutions can cause skin sensitization.

Eye Contact: Causes severe irritation and possible corneal ulceration.

Chronic Exposure:

Repeated exposure to vapor or dust (typically 10 to 30 mg/m³) for > 5 years has caused brownish staining of the conjunctiva which may be followed by changes to the cornea leading to loss of visual acuity. Repeated exposure may also cause skin effects.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin or eye disorders or impaired respiratory function may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 2 mg/m³ (TWA)
- ACGIH Threshold Limit Value (TLV): 2 mg/m³ (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge and dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres. This compound possibly exists in both particulate and vapor phase. A gas/vapor cartridge should be used in addition to the particulate filter. If the vapor concentration alone exceeds the exposure limits, use a supplied air respirator, because warning properties are unknown for these compounds.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Isolate from oxidizing materials. Protect from direct sunlight. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BENZOYL PEROXIDE****0409****PRODUCT INFORMATION**

Chemical name and Synonyms: Benzoyl peroxide, Dibenzoyl peroxide; benzoic acid, peroxide; benzoperoxide

Chinese Name: 過氧化苯<甲>

CAS No: 94-36-0

Molecular Weight: 242.23

Chemical Formula: C₁₄H₁₀O₄

RISK SYMBOL**PHYSICAL DATA**

Appearance: White crystals.

Boiling Point: Decomposes explosively above melting point.

Odor: Faint odor of benzaldehyde.

Melting Point: 103 - 106°C (217 - 223°F)

Solubility: Slightly soluble in water.

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Vapor Density (Air=1): No information found.
Specific Gravity: 1.334 @ 25°C
Vapor Pressure (mm Hg): < 1 @ 20°C (68°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire:

Flash point: 40°C (104°F) CC
Autoignition temperature: 80°C (176°F)
Extremely Flammable!
Substance is a strong oxidizer and a strong supporter of combustion. Its heat of reaction with combustibles and reducing agents can cause ignition.

Explosion:

Explosive! Extremely explosion-sensitive to shock, heat and friction. May explode spontaneously when dry.
Sensitive to mechanical impact. Sensitive to static discharge.

Fire Extinguishing Media:

Water or water spray. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Fight fires with water from an explosion-resistant location. In advanced or massive fires, the area should be evacuated. Clean-up and salvage operations after a fire should not be attempted until all of the peroxide has cooled completely.

REACTIVITY DATA

Stability:

Danger! Highly reactive material. Becomes unstable and spontaneously explosive at elevated temperatures.

Hazardous Decomposition Products:

Decomposes with formation of dense white smoke of benzoic acid, phenyl benzoate, terphenyls, biphenyls, benzene and carbon dioxide.

Hazardous Polymerization: Will not occur.

Incompatibilities:

A powerful oxidizer, benzoyl peroxide is incompatible with many materials including organic and inorganic acids, alcohols, amines, metallic naphthenates, polymerization accelerators and easily oxidized materials. Heat, friction, organic matter, methyl methacrylate, N, N- dimethylaniline, lithium aluminum hydride, and carbon tetrachloride with ethylene have all caused fire or explosions when placed in contact with benzoyl peroxide.

Conditions to Avoid: Heat, flame, ignition sources, shock, friction, incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Danger! Strong oxidizer. Contact with other material may cause fire. Extremely explosion-sensitive to shock, heat and friction. Extremely flammable. Unstable at elevated temperatures. Harmful if swallowed or inhaled. Allergen. Exposure may produce allergic response. Causes irritation to skin, eyes and respiratory tract.

Potential Health Effects

Inhalation:

Inhalation of dust causes irritation to the mucous membranes with coughing, sore throat. Decomposition products are toxic and inhalation of the products can produce life threatening health effects.

Ingestion: Ingestion may cause abdominal pain, nausea, vomiting.

Skin Contact:

Causes irritation with redness and pain, and skin sensitization in some individuals. Stinging or burning sensation may occur for a brief time after application to skin.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure: Exposure may cause asthmatic effects to occur in some individuals.

Aggravation of Pre-existing Conditions: Prolonged or repeated contact may cause sensitization dermatitis.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of soap and water. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 5 mg/m³ (TWA)
- ACGIH Threshold Limit Value (TLV): 5 mg/m³ (TWA); A4 - not classifiable as a human carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge and dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres. This compound possibly exists in both particulate and vapor phase. A gas/vapor cartridge should be used in addition to the particulate filter. If the vapor concentration alone exceeds the exposure limits, use a supplied air respirator, because warning properties are unknown for these compounds.

Skin Protection:

Wear impervious (preferably, fire-resistant and antistatic) protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Plastic may generate static electricity. Use appropriate shoes to prevent a static electricity build-up.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect containers against physical damage. Isolate in a well-detached, fire-resistant, cool and well-ventilated building with no other materials stored therein. Shield containers from direct sunlight and maintain their temperature at less than 38°C (100°F). Employ grounding, bonding, venting and explosion relief provisions in accord with accepted engineering practices in any process capable of generating an explosion due to static discharge, shock, impact, heat, friction, or blows. Provide explosion venting in a safe direction and prohibit any electrical installation or heating facilities. Benzoyl peroxide should be stored in and used from original containers. Do not return product which has been taken out of original container. Never mix unless at least 33% water is present. **KEEP PURE!** Impurities are hazardous in peroxides. Do not add accelerators. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product. Do not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Provide maximum explosion-proof ventilation. Wear appropriate personal protective equipment as specified in Section 8.

Spills:

The above information is believed to be accurate to the best of our knowledge.
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Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. The spilled material can be mixed with water-wetted vermiculite, swept up, and then placed into appropriate plastic containers for immediate disposal.

Benzoyl peroxide may be destroyed by pouring it slowly into about 10 times its own weight of about 10% sodium hydroxide solution. Stir while adding water to thin as needed, and flush down drain when complete. Empty peroxide containers should be disposed of by remote burning or should be washed with 10% sodium hydroxide.

Material Safety Data Sheet

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MSDS**BENZYL BENZOATE****0410****PRODUCT INFORMATION**

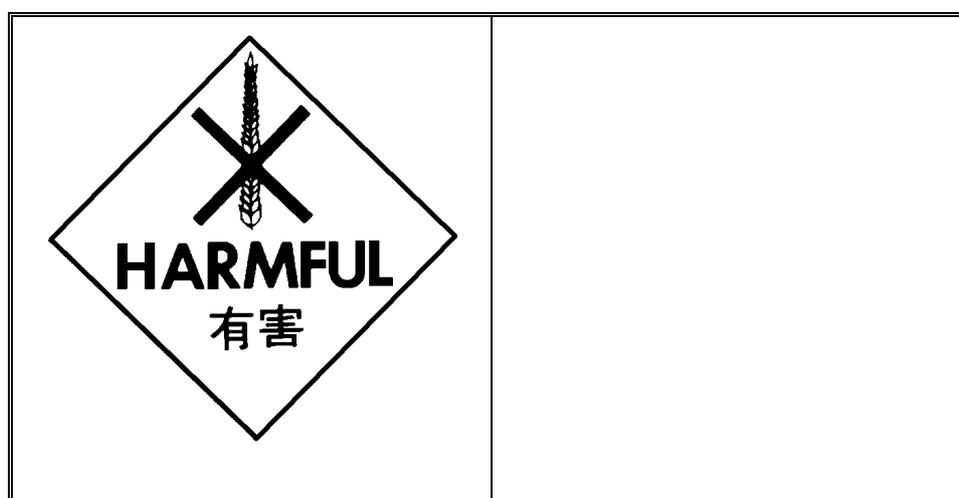
Product Name(S) : BENZYL BENZOATE

Chinese Name: 苯(甲)酸苄酯

Synonyms: Benzoic acid phenylmethyl ester; benzoic acid, benzyl ester

CAS No: 120-51-4

Molecular Weight: 212.25

Chemical Formula: C₁₄H₁₂O₂**RISK SYMBOL****PHYSICAL DATA**

Appearance: Oily liquid or leaflets depending on temperature.

Boiling Point: 323 - 324°C (613 - 615°F)

Odor: Faint aromatic odor.

Melting Point: 21°C (70°F)

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Solubility: Insoluble in water.
Vapor Density (Air=1): 7.31
Specific Gravity: 1.118 @ 25°C/4C
Vapor Pressure (mm Hg): 0.000224 @ 25°C (77°F)
pH: No information found.
Evaporation Rate (BuAc=1): information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire:

Flash point: 148°C (298°F) CC
Autoignition temperature: 480°C (896°F)
May ignite when exposed to heat or flame. Contact with strong oxidizers may cause fire.

Explosion: Above the flash point, explosive vapor-air mixtures may be formed.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers, acids, bases, and reducing agents.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! May be harmful if swallowed or inhaled. Causes irritation to eyes and skin.

Potential Health Effects

Information on the human health effects from exposure to this substance is limited.

Inhalation: No information found, but compound should be handled as a potential health hazard.

Ingestion:

Considered relatively non-toxic to humans - but information on the human health effects from ingestion is limited.
Animal studies indicate moderate toxicity from ingestion. Should be handled as a potential health hazard.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids, vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8.

Solid Spills:

Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Liquid Spills:

Absorb with vermiculite, dry sand, earth or similar material and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer.

Material Safety Data Sheet

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MSDS**BROMOPHENOL BLUE****0411**

PRODUCT INFORMATION

Product Name(S) : BROMOPHENOL BLUE

Chinese Name: 溴酚藍

Synonyms:

3,3',5,5'-Tetrabromophenol sulfonphthalein; 4,4'-(3H-2,1-benzoxathiol-3-ylidene)bis[2,6-dibromopheno l]S,S
dioxide

CAS No: 115-39-9

Molecular Weight: 670.02

Chemical Formula: C₁₉H₁₀Br₄O₅S

RISK SYMBOL

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PHYSICAL DATA

Appearance: Tan to orange, light pink to purple or red crystalline powder.

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The above information is believed to be accurate to the best of our knowledge.
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Boiling Point: 279°C (534°F)

Odor: Slightly amine to odorless.

Melting Point: 273°C (523°F)

Solubility: 0.4g/100g water @ 20°C (68°F).

Vapor Density (Air=1): No information found.

Specific Gravity: No information found.

Vapor Pressure (mm Hg): No information found.

pH: No information found.

Evaporation Rate (BuAc=1): No information found.

% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Burning may produce bromides, sulfur oxides, carbon dioxide, and carbon monoxide.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Caution! May be harmful if swallowed or inhaled. May cause irritation to skin, eyes, and respiratory tract.

Potential Health Effects

Inhalation:

May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.

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Ingestion:

Effects not determined. Large oral doses may cause irritation to the gastrointestinal tract.

Skin Contact: May cause irritation with redness and pain.

Eye Contact: May cause irritation, redness and pain.

Chronic Exposure: Not determined.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

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Material Safety Data Sheet

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MSDS**BUTANE****0412**

PRODUCT INFORMATION

Chemical name: Butane

Chinese Name: 丁烷

CAS NUMBER: 106-97-8

Synonym(s): process stream; methyl-ethyl methane; butyl hydride; S-409; AB2/AB1-7

Chemical family: alkane

Molecular formula: C₄H₁₀

Molecular weight: 58.12

RISK SYMBOL



PHYSICAL DATA

Boiling point: -0.5 °C (-31.1 °F)

Specific gravity: 0.588 @ 25 °C

Melting point: -138 °C (-217 °F)

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% Volatile: 100
Vapor pressure: 2 mm Hg @ 18.8 °C
Evaporation rate (water=1): NA
Vapor density (air=1): 2
Viscosity: NA
% solubility in water: soluble
Octanol/water partition coefficient:
Pour point: NA
pH: NA
Appearance/odor: Colorless gas with natural gas odor.

FIRE AND EXPLOSION DATA

Flash point: -60.000 °C (-76° F)
Autoignition temperature: 405.000 °C (761 °F)
Flammability limits in air (% by vol.) Lower: 1.900
Flammability limits in air (% by vol.) Upper: 8.500

Basic firefighting procedures:

Shut off source of flow if possible. Do not extinguish fire if gas source cannot be shut off. Use a water spray to cool fire-exposed containers, structures and to protect personnel. If leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop a leak.

*NOTE: The flash point varies depending on the process stream. If available, see the "Unit Stream Report" for the flash point of the specific stream of interest.

Unusual fire and explosion hazards:

Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back. Dangerous when exposed to heat or flame. Materials can ignite under normal atmospheric conditions in the absence of any ignition source. Containers may explode in heat of fire. Irritating or toxic substances may be emitted upon thermal decomposition. Vapors or gas may accumulate in low areas. Vapors may concentrate in confined areas.

REACTIVITY DATA

Stability/incompatibility:

Avoid contact with strong oxidizers. Explosive hazard at high temperatures.
Avoid contact with peroxides, plastics, heat and chlorine dioxide.

Hazardous reactions/decomposition products:

When burned in a deficiency of oxygen, CO can be formed. Thermal decomposition products may be hazardous.

HEALTH HAZARD DATA

Ingestion: NA

Skin: Contact with liquefied material may cause frostbite.

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Eye: Contact with liquefied material may cause frostbite.

Inhalation:

May cause harmful central nervous system effects. Effects may include excitation, euphoria, headache, dizziness, drowsiness, blurred vision, fatigue, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death. At high concentrations and when mixed with air, the gas may become an anesthetic and subsequently an asphyxiant by diluting or decreasing the available oxygen in potential breathing zones. May also cause anemia and irregular heart rhythm.

Special toxic effects: ND

NOTE: This product has not been tested as a whole for all potential health effects. It may have other health hazards related to its components. See "Ingredient/Health Hazards" for additional information. IARC has determined that occupational exposures in petroleum refining are probably carcinogenic to humans.

FIRST AID MEASURES

Ingestion: NA

Skin contact:

Contact with liquefied gas may cause frostbite. Keep affected area warm. If possible, submerge affected area in lukewarm water. Get immediate medical attention.

Eye contact:

Contact with liquefied gas may cause frostbite. Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get immediate medical attention.

Inhalation:

Remove affected person from source of exposure. If not breathing, ensure clear airway and institute cardiopulmonary resuscitation (CPR). If breathing is difficult, administer oxygen if available. Get immediate medical attention.

NOTES TO PHYSICIAN :

Hydrocarbons may sensitize the heart to epinephrine and other circulating catecholamines so that arrhythmias may result. Therefore, do not give epinephrine or other stimulants that may cause ventricular arrhythmias.

PREVENTATIVE MEASURES

Eye protection:

Avoid eye contact with this material. Wear safety glasses or chemical goggles. Provide an eyewash station in the work area. Do not wear contact lenses when working with this substance.

Skin protection:

Avoid skin contact. When working with this substance, wear appropriate chemical protective gloves. Depending upon conditions of use, additional protection may be necessary such as face shield, apron, armcovers, etc.

Respiratory protection:

If exposure limits are exceeded or if irritation is experienced, NIOSH approved respiratory protection should be worn. Ventilation and other forms of engineering controls are often the preferred means for controlling chemical exposures. Respiratory protection may be needed for non-routine or emergency situations.

ENVIRONMENTAL PROTECTION DATA

Emergency Action:

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, keep out of low areas, and ventilate closed spaces before entering. (Also see Personal Protection Information section.) Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.

Spill or Leak Procedure:

Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch or walk through spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors; isolate area until gas has dispersed.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHYL ETHYL KETONE****0413**

PRODUCT INFORMATION

Chemical name and Synonyms: 2-Butanone; ethyl methyl ketone; MEK; Methyl acetone

Chinese Name: 甲基乙基酮

CAS No: 78-93-3

Molecular Weight: 72.11

Chemical Formula: $\text{CH}_3\text{COCH}_2\text{CH}_3$

RISK SYMBOL



PHYSICAL DATA

Appearance: Clear, colorless liquid.

Boiling Point: 80°C (176°F)

Odor: Sharp mint-like odor.

Melting Point: -86°C (-123°F)

Solubility: 29 g in 100 g of water.

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Vapor Density (Air=1): 2.5
Specific Gravity: 0.81 @ 20°C/4C
Vapor Pressure (mm Hg): 78 @ 20°C (68°F)
pH: No information found.
Evaporation Rate (BuAc=1): 2.7 (Ether = 1)
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: -9°C (16°F) CC
Autoignition temperature: 404°C (759°F)
Flammable limits in air % by volume: LEL: 1.4; UEL: 11.4
Extremely Flammable.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. This highly flammable liquid must be kept from sparks, open flame, hot surfaces, and all sources of heat and ignition.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Oxidizing materials, caustics, amines, ammonia, strong bases, chloroform, chlorosulfonic acid, oleum, potassium-t-butoxide, heat or flame, hydrogen peroxide, nitric acid. Can attack many plastics, resins and rubber.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

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Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Harmful or fatal if swallowed. Harmful if inhaled or absorbed through skin. Affects central nervous system. Causes irritation to skin, eyes and respiratory tract.

Potential Health Effects

Inhalation:

Causes irritation to the nose and throat. Concentrations above the TLV may cause headache, dizziness, nausea, shortness of breath, and vomiting. Higher concentrations may cause central nervous system depression and unconsciousness.

Ingestion:

May produce abdominal pain, nausea. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms expected to parallel inhalation.

Skin Contact:

Causes irritation to skin. Symptoms include redness, itching, and pain. May be absorbed through the skin with possible systemic effects.

Eye Contact: Vapors are irritating to the eyes. Splashes can produce painful irritation and eye damage.

Chronic Exposure:

Prolonged skin contact may defeat the skin and produce dermatitis. Chronic exposure may cause central nervous system effects.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 200 ppm (TWA)
- ACGIH Threshold Limit Value (TLV): 200 ppm (TWA), 300 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Butyl rubber is a suitable material for personal protective equipment.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

Material Safety Data Sheet

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MSDS**MALEIC ACID****0414****PRODUCT INFORMATION**

Chemical Name(s) : MALEIC ACID

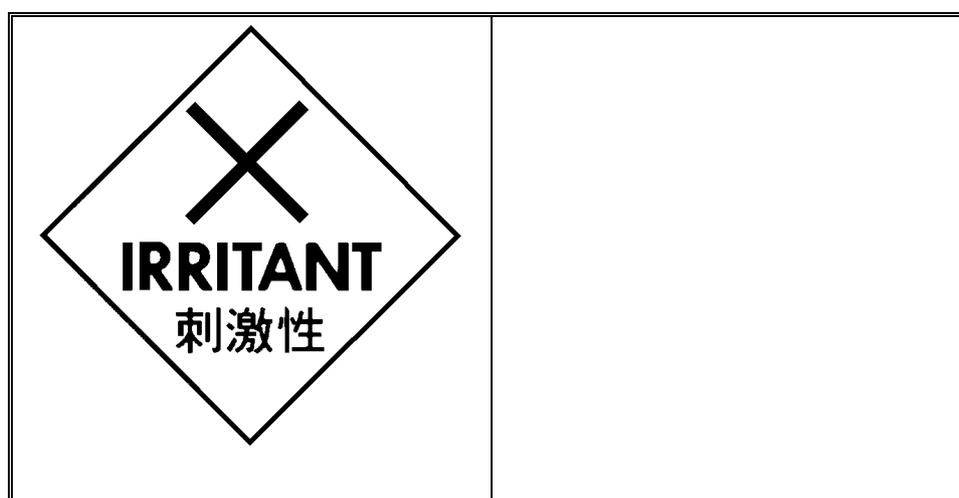
Chinese Name: 馬來酸

Synonyms: (Z)-Butenedioic acid; cis-butenedioic acid; maleinic acid, toxilic acid

CAS No: 110-16-7

Molecular Weight: 116.08

Chemical Formula: HOCHOH:CHCOOH

RISK SYMBOL**PHYSICAL DATA**

Appearance: White crystals.

Boiling Point: 135C (275F) Decomposes.

Odor: Faint acidulous odor.

Melting Point: 130 - 139C (266 - 282F)

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Solubility: Soluble in water.
Vapor Density (Air=1): 4.0
Density: 1.590 @ 20C/4C
Vapor Pressure (mm Hg): No information found.
pH: < 7 Acidic.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21C (70F): 0

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: Heat, dusting and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Danger! Corrosive. Causes severe eye irritation and possible burns. Causes irritation to skin and respiratory tract.
May be harmful if swallowed or absorbed through skin.

Potential Health Effects

Inhalation:

Inhalation of dust is irritating to the mucous membrane and upper respiratory tract. May cause coughing, sore throat, shortness of breath.

Ingestion:

Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. May cause mild burning of mouth, throat, and stomach.

Skin Contact:

Causes irritation to skin. Symptoms include redness, itching, and pain. May be absorbed through the skin. Wet skin may exacerbate skin exposure.

Eye Contact:

Causes severe eye irritation with redness and pain. May cause burns. May cause conjunctivitis or corneal damage.

Chronic Exposure:

Abnormalities of kidney function with protein in the urine may develop from chronic exposure.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product. Avoid dust formation and control ignition sources. Employ grounding, venting and explosion relief provisions in accord with accepted engineering practices in any process capable of generating dust and/or static electricity. Empty only into inert or non-flammable atmosphere. Emptying contents into a non-inert atmosphere where flammable vapors may be present could cause a flash fire or explosion due to electrostatic discharge.

ENVIRONMENTAL PROTECTION DATA

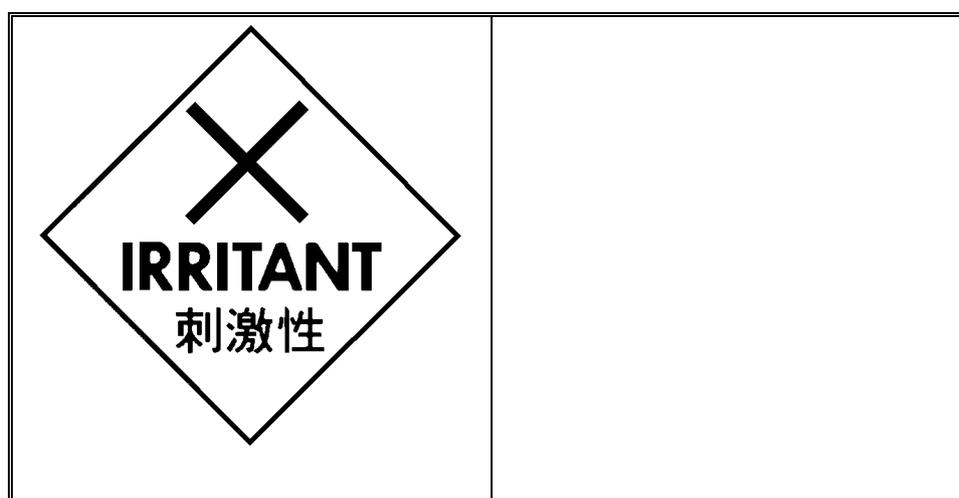
Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

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MSDS**CALCIUM CHLORIDE****0415****PRODUCT INFORMATION**

Chemical Name(S) : Calcium chloride
Chinese Name: 氯化鈣
Chemical Formula : CaCl_2 .
Molecular Weight : 110.9.
Chemical Family : Alkali chloride.
CAS : 10035-04-8

RISK SYMBOL**PHYSICAL DATA**

Physical State: Solid.
Odour : No odour.
Odour Threshold: N.A.P.
Vapour Pressure (mmHg) : N.A.P.

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Vapour Density (Air=1) : N.AP.
Evaporation Rate : N.AP.
Boiling Point : >1600 (°C).
pH : N.AV.
Specific Gravity (Water=1): 2.16.
Solubility In Water (% W/W) :42.
Coefficient Of Water/Oil Dist : N.AP.

FIRE AND EXPLOSION DATA

Flammability: Not flammable.
Extinguishing Media: Suitable for surrounding fire.
Special Procedures : . No special instructions.
Flash Point (°C), Method : Not flammable.
Auto Ignition Temperature: N.AP.
Upper Flammable Limit (% By Vol.): N.AP.
Lower Flammable Limit (% By Vol.): N.AP.
Explosion Data
Explosive Power: N.AV.
Rate Of Burning: N.AV.
Sensitivity To Static Discharge: No.
Sensitivity To Impact: . No.
Unusual Fire And Explosion Hazards: None.
Hazardous Combustion Products: None.

REACTIVITY DATA

Chemical Stability: YES
Compatibility With Other Substances:
Yes ., Methyl vinyl ether. Water. Sulphuric acid: yields hydrogen chloride gas, which is corrosive, irritating, and reactive.
Reactivity Conditions?: Heat is evolved when water is added.
Hazardous Products Of Decomposition: None.
Hazardous Polymerization : Will not occur.

HEALTH HAZARD DATA

Route Of Entry:
Skin Contact :
Contact with abraded skin or cuts can cause necrosis of tissues. May cause irritation. Prolonged or repeated exposure may cause skin irritation, even a burn.
Skin Absorption :

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Eye Contact: May irritate or burn eyes.

Inhalation : Dust may be irritating.

Inhalation, Chronic: N.Av.

Ingestion: Low toxicity.

Effects Of Chronic Exposure:

No chronic health effects are expected from normal use of this product.

FIRST AID MEASURES

Instructions:

Flush eyes with large amounts of running water for at least 15 minutes. Hold eyelids apart to ensure rinsing of the entire surface of the eye and lids with water. If irritation persists, get medical attention. Remove any contaminated clothing and wash affected area with plenty of soap and water. In case of ingestion, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

PREVENTATIVE MEASURES

Gloves/ Type: Wear impervious gloves.

Respiratory/Type:

Where airborne concentrations are expected to exceed exposure limits. Wear a properly fitted NIOSH/MSHA approved respirator.

Eye/Type: Chemical safety goggles. Do not wear contact lenses.

Footwear/Type: Boots.

Clothing/Type: FULL COVER CLOTHING.

Other/Type: EYE BATH AND SAFETY SHOWER.

Engineering Controls: Adequate ventilation to avoid chronic inhalation of dust.

Handling Procedures And Equipment:

When dissolving, add water cautiously with stirring. Avoid all skin contact. Avoid getting in eyes. Avoid skin and eye contact. Avoid breathing dust. Remove contaminated clothing before reuse. Handle in accordance with good industrial hygiene and safety practices.

Storage Needs: Store in a cool and dark area. Keep away from moisture to prevent caking.

ENVIRONMENTAL PROTECTION DATA

Leak/Spill:

Scrape or shovel into containers. Place in a closed chemical waste containers. Cautiously spray residue with plenty of water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Calcium Acetate, Monohydrate****0416****PRODUCT INFORMATION**

Chemical name(s) : Calcium Acetate, Monohydrate

Chinese Name: 乙酸鈣

Synonyms: Calcium Acetate Hydrate; Calcium Diacetate, Monohydrate

CAS No: 62-54-4

Molecular Weight: 176.19

Chemical Formula: $(\text{CH}_3\text{COO})_2\text{Ca} \cdot \text{H}_2\text{O}$ **RISK SYMBOL**

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PHYSICAL DATA

Appearance: White Powder.

Boiling Point: No information found.

Odor: Slight acetic acid odor.

Melting Point: $> 160^\circ\text{C}$ ($> 320^\circ\text{F}$) Decomposes to form acetone, calcium carbonate.

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Solubility: Soluble in water.
Vapor Density (Air=1): Not applicable.
Density: ca. 1.50
Vapor Pressure (mm Hg): Not applicable.
pH: 7.6 (0.2M aq. sol.)
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: When heated above 160°C (320°F) in enclosed spaces may generate highly flammable/explosive acetone.

Explosion: Not considered to be an explosion hazard, except when heated (See above).

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Very hygroscopic.

Hazardous Decomposition Products:

Acetone vapor (flammable, explosive) at temperatures above 160°C (320°F), also acrid fumes, possibly carbon monoxide.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers at high temperatures.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: Not expected to be a health hazard.

Ingestion: Not expected to be a health hazard.

Skin Contact: Not expected to be a health hazard from skin exposure.

Eye Contact: No adverse effects expected.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 15 mg/m³ total dust, 5 mg/m³ respirable fraction for nuisance dusts.

- ACGIH Threshold Limit Value (TLV):

10 mg/m³ total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Calcium Hypochlorite****0417**

PRODUCT INFORMATION

Chemical name(s) : Calcium Hypochlorite

Chinese Name: 次氯酸鈣

Synonyms: Hypochlorous Acid, Calcium Salt; Losantin; Calcium Hypochloride; Chlorinated lime

CAS No: 7778-54-3

Molecular Weight: 142.98

Chemical Formula: CaCl_2O_2

RISK SYMBOL



PHYSICAL DATA

Appearance: White or grayish-white powder.

Boiling Point: No information found.

Odor: Chlorine-like odor.

Melting Point: Decomposes above 177°C (350°F), releasing oxygen.

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Soluble in water; reacts, releasing chlorine gas.
Vapor Density (Air=1): 6.9
Specific Gravity: 2.35 @ 20°C
Vapor Pressure (mm Hg): Not applicable.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Thermally unstable; at higher temperatures, may undergo accelerated decomposition with release of heat and oxygen.

Explosion:

Sealed containers may rupture when heated. An explosion can occur if either a carbon tetrachloride or a dry ammonium compound fire extinguisher is used to extinguish a fire involving calcium hypochlorite. Sensitive to mechanical impact.

Fire Extinguishing Media:

Use flooding quantities of water as fog or spray. Use water spray to keep fire-exposed containers cool. Avoid direct contact with water; reacts with water releasing chlorine gas. Fight fire from protected location or maximum possible distance. Do not use dry chemical fire extinguishers containing ammonium compounds. Do not use carbon tetrachloride fire extinguishers. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Rapidly decomposes on exposure to air. May decompose violently if exposed to heat or direct sunlight. Thermally unstable; decomposes at 177°C (350°F).

Hazardous Decomposition Products: Calcium hypochlorite gives off oxygen, chlorine and chlorine monoxide.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Calcium hypochlorite is a strong oxidizer. Reacts with water and acids giving off chlorine gas. Forms explosive compounds with ammonia and amines. Incompatible with organic materials, nitrogen compounds and combustible materials.

Conditions to Avoid: Heat, flame, moisture, dusting, sources of ignition and shock, and incompatibles.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
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Emergency Overview

Danger! Strong oxidizer. Contact with other material may cause fire. Corrosive. Causes burns to any area of contact. Harmful if swallowed or inhaled. Water reactive.

Potential Health Effects

Inhalation:

Corrosive. Extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. Inhalation may be fatal as a result of spasm inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.

Ingestion:

Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach. Can cause sore throat, vomiting, diarrhea.

Skin Contact: Corrosive. Symptoms of redness, pain, and severe burn can occur.

Eye Contact: Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns.

Chronic Exposure:

Repeated exposures to calcium hypochlorite may cause bronchitis to develop with cough and/or shortness of breath.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage and moisture. Isolate from any source of heat or ignition. Avoid storage on wood floors. Separate from incompatibles, combustibles, organic or other readily oxidizable materials. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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ENVIRONMENTAL PROTECTION DATA

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Remove all sources of ignition. Keep water away from spilled material. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Pick up spill for recovery or disposal and place in a closed container. Do not seal tightly.

Material Safety Data Sheet

City University of Hong Kong

MSDS CALCIUM PHOSPHATE MONOBASIC 0418

PRODUCT INFORMATION

Chemical name(s) : CALCIUM PHOSPHATE MONOBASIC

Chinese Name: 磷酸二氫鈣

Synonyms:

Calcium Dihydrogen Phosphate; Phosphoric acid, calcium salt (2:1), monohydrate; acid calcium phosphate; monocalcium orthophosphate; calcium superphosphate

CAS No: 7758-23-8

Molecular Weight: 252

Chemical Formula: $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$

RISK SYMBOL

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PHYSICAL DATA

Appearance: White, crystalline powder.

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Boiling Point: 203°C (397°F)
Odor: Odorless.
Melting Point: 100°C (212°F)
Solubility: 2 g in 100 g of water
Vapor Density (Air=1): No information found.
Density: 2.22 @ 18°C / 4C
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): Not applicable.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: No information found.
Hazardous Polymerization: Will not occur.
Incompatibilities: No incompatibility data found.
Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

WARNING! DIRECT CONTACT WITH EYES MAY CAUSE SEVERE IRRITATION OR BURNS. MAY CAUSE RESPIRATORY TRACT IRRITATION.

Potential Health Effects

Inhalation: Inhalation of dust may cause irritation to the respiratory tract.
Ingestion: No adverse effects expected. Extremely large oral dosages may produce gastrointestinal disturbances.
Skin Contact: No adverse effects expected but may cause minor skin irritation.
Eye Contact: Direct contact with the eyes is irritating and may cause corneal damage.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion: Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.
Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally.
Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. Small amounts of residue may be flushed to sewer with plenty of water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Castor Oil****0419**

PRODUCT INFORMATION

chemical name(s) : Castor Oil, U.S.P.

Chinese Name: 蓖麻<籽>油

Synonyms: Ricinus Oil

CAS No: 8001-79-4

Molecular Weight: Not applicable.

Chemical Formula: Not applicable.

RISK SYMBOL

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PHYSICAL DATA

Appearance: Light yellow viscous liquid.

Boiling Point: 313°C (595°F)

Odor: Slight characteristic odor.

Melting Point: -10°C (14°F)

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Solubility: Negligible (< 0.1%)
Vapor Density (Air=1): Not applicable.
Specific Gravity: 0.961-0.963 @ 15.5°C/15.5°C
Vapor Pressure (mm Hg): Not applicable.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: 229°C (444°F) CC
Autoignition temperature: 449°C (840°F)
Not considered to be a fire hazard.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Water or foam may cause frothing.

Special Information: Use protective clothing and breathing equipment appropriate for the surrounding fire.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: Excessive heat, freezing and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: No adverse health effects expected from inhalation.

Ingestion: No adverse effects expected. Large oral doses may cause spasmodic intestinal or abdominal pain.

Skin Contact: Not expected to be a health hazard from skin exposure. May cause mild irritation and redness.

Eye Contact: No adverse effects expected. May cause mild irritation, possible reddening.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Not expected to require first aid measures.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact:

Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Not expected to require first aid measures. Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

In general, dilution ventilation is a satisfactory health hazard control for this substance. However, if conditions of use create discomfort to the worker, a local exhaust system should be considered.

Personal Respirators (NIOSH Approved):

Airborne exposure is not expected to be a problem under ordinary handling conditions.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Protect from excessive heat. Protect from freezing.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Small amounts of residue may be flushed to sewer with plenty of water.

Material Safety Data Sheet

City University of Hong Kong

MSDS 2-CHLORO-2-METHYLPROPANE 0420

PRODUCT INFORMATION

Chemical name(s) : 2-CHLORO-2-METHYLPROPANE

Chinese Name: 2-氯-2-甲基丙烷 , 2-甲基-2-氯丙烷

Synonyms: tert-Butyl chloride; 2-chloroisobutane; Trimethylchloromethane

CAS No: 507-20-0

Molecular Weight: 92.57

Chemical Formula: (CH₃)₃CCl

RISK SYMBOL

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PHYSICAL DATA

Appearance: Clear, colorless liquid.

Boiling Point: 51 - 52°C (124 - 126°F)

Odor: No information found.

Melting Point: -25°C (-13°F)

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Solubility: Sparingly soluble in water.
Vapor Density (Air=1): 3.2
Specific Gravity: 0.87
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: < 0°C (< 32°F)
Flammable liquid.
Dangerous fire hazard when exposed to heat, flame, sparks, or oxidizers.

Explosion:

Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back. Sealed containers may rupture when heated. Contact with strong oxidizers may cause fire. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

May emit oxides of carbon and hydrogen chloride gas when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers and strong bases.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Flammable liquid and vapor. May be harmful if swallowed, inhaled or absorbed through skin. May affect central nervous system. May cause irritation to skin, eyes, and respiratory tract.

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Potential Health Effects

There is limited information available on the hazards of this chemical. It is assumed that it will behave similarly to other chlorinated hydrocarbons.

Inhalation:

No information found, but compound should be handled as a potential health hazard. May cause irritation to the respiratory tract; symptoms may include coughing, shortness of breath, headache, and dullness. High concentrations have a narcotic effect.

Ingestion: May cause abdominal pain, vomiting. Other symptoms parallel inhalation.

Skin Contact:

May cause irritation with redness and pain. May be absorbed through the skin with possible systemic effects.

Eye Contact: May cause irritation, redness and pain.

Chronic Exposure:

Similar compounds demonstrate toxic effects after repeated exposures too low to result in acute effects.

Aggravation of Pre-existing Conditions: No information found.

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FIRST AID MEASURES
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Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Call a physician if irritation persists.

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PREVENTATIVE MEASURES
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Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source,

preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

Material Safety Data Sheet

City University of Hong Kong

MSDS**n-Butyl Chloride****0421**

PRODUCT INFORMATION

Chemical Name: n-Butyl Chloride

Chinese Name: 丁基氯

Chemical Family: Chlorinated Hydrocarbon

Molecular Weight: 92.57

Formula: C₄H₉Cl

Synonyms: Butyl Chloride, 1-Chlorobutane

CAS Number: 109-69-3

RISK SYMBOL



PHYSICAL DATA

Boiling Point, 760 mm Hg: 78.4°C

Vapor Pressure at 20°C: 80.1 mm Hg

% Volatiles by Volume: ca 100

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Freezing Point: -123.1°C
Vapor Density (air=1): 3.2
Specific Gravity (H₂O=1): @ 20°C 0.886
Evaporation Rate: (BuAc=1) ca 10
Solubility in Water: @ 20°C 0.11%

FIRE AND EXPLOSION DATA

Flash Point (test method): -9°C (Tag closed cup)
Auto Ignition Temperature: 460°C
Flammable Limits in Air % by Volume: Lower Limit: 1.8 Upper Limit: 10.1
Unusual Fire and Explosion Hazards: Very volatile and extremely flammable
Extinguishing Media: Carbon dioxide, dry chemical or foam
Special Fire Fighting Procedures:
Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers. Keep fire-exposed containers cool with water spray.

REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: Not expected to occur
Appearance and Odor: Clear, colorless liquid with a sharp, unpleasant odor
Conditions to Avoid: Heat, sparks, open flame, open containers, and poor ventilation
Materials to Avoid: Active metals and strong bases
Hazardous Decomposition Products:
Incomplete combustion can generate phosgene, hydrogen chloride, and other toxic vapors

HEALTH HAZARD DATA

Carcinogenic Data: n-Butyl Chloride is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Primary Routes of Entry:

N-Butyl Chloride may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation: Exposure can cause depression or stimulation of the central nervous system.

Eye Contact: Liquid and high vapor concentration can cause irritation.

Skin Contact: Prolonged or repeated skin contact can cause mild irritation and dermatitis through defatting of skin.

Ingestion: Can cause gastrointestinal tract discomfort.

Effects of Overexposure:

N-Butyl Chloride is a mild irritant. Acute exposure irritates the eyes and upper respiratory tract. Chronic toxicity properties have not been adequately determined.

Medical Condition Aggravated by Exposure: Preclude from exposure those individuals susceptible to dermatitis.

FIRST AID MEASURES

Inhalation:

Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse, administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact: Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact:

Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion:

Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

PREVENTATIVE MEASURES

Ventilation:

Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory:

Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes:

Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin:

Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or nitrile rubber offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to n-Butyl Chloride may require additional protective equipment.

Storage:

N-Butyl Chloride should be protected from temperature extremes and direct sunlight. Proper storage of n-Butyl Chloride must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, n-Butyl Chloride should be stored in an acceptably protected and secure flammable liquid storage room.

Other:

Emergency eyewash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

ENVIRONMENTAL PROTECTION DATA

Spill Control:

Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements. CERCLA Reportable Quantity: None.

Material Safety Data Sheet

City University of Hong Kong

MSDS**COBALT CHLORIDE****0422****PRODUCT INFORMATION**

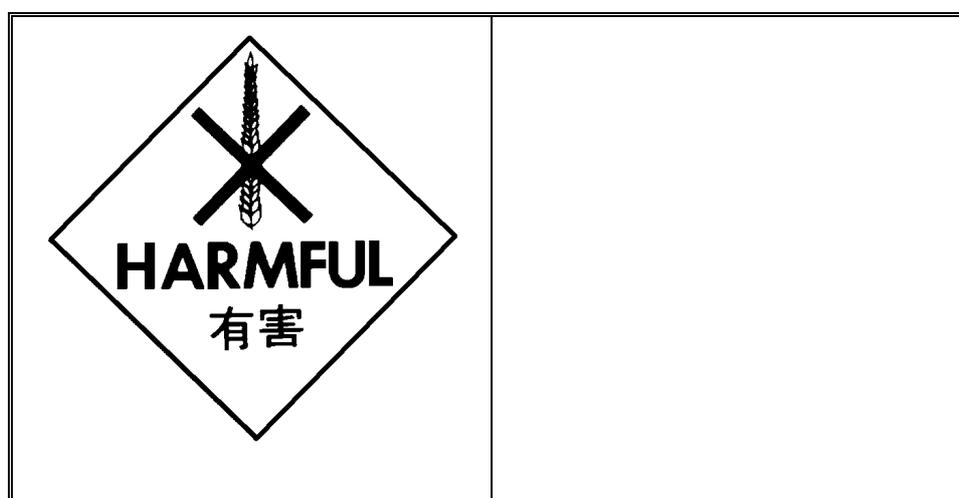
Chemical name(s) : COBALT CHLORIDE

Chinese Name: 氯化鈷(II)

Synonyms: Cobaltous chloride, hexahydrate; cobalt (2+) chloride hexahydrate, cobalt dichloride

CAS No: 7646-79-9

Molecular Weight: 237.93

Chemical Formula: $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ **RISK SYMBOL****PHYSICAL DATA**

Appearance: Rose-red crystals.

Boiling Point: 110°C (230°F) (Loses 6H₂O)

Odor: Odorless.

Melting Point: 86°C (187°F)

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Solubility: 76.7 g/100 cc water @ 0°C
Vapor Density (Air=1): No information found.
Density: 1.92 @ 20°C
Vapor Pressure (mm Hg): 40 @ 770°C (1418°F)
pH: 4.6
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information: Use protective clothing and breathing equipment appropriate for the surrounding fire.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Emits toxic chlorides and possibly cobalt fumes when heated to decomposition. Cobalt oxide fumes may form in fire.
Hazardous Polymerization: Will not occur.
Incompatibilities:
Strong oxidizers, strong mineral acids, tert-butyl hydroperoxide, potassium and metal halides, sodium dispersions.
Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. May cause allergic skin or respiratory reaction. Chronic exposure may affect thyroid, lungs, heart, and kidneys.

Potential Health Effects

Inhalation:

Causes irritation to the respiratory tract, symptoms may include coughing, shortness of breath, and nausea. Respiratory hypersensitivity, asthma may appear. Inhalation of cobalt dust and fumes is associated with an increased incidence of lung disease.

Ingestion:

Toxic. Causes abdominal pain, nausea, vomiting, flushing of the face and ears, mild hypotension, rash, and ringing in the ears. May have cumulative toxic action where elimination cannot keep pace with absorption. Large amounts depress erythrocyte production.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain. May cause dermatitis.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure:

Repeated oral administration may produce goiter and reduced thyroid activity. Prolonged or repeated skin exposure may cause dermatitis. Chronic exposure associated with kidney, liver, heart and lung damage.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance. Persons with allergies or sensitivity to cobalt may also be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

For Cobalt Compound:

-OSHA Permissible Exposure Limit (PEL): 0.1 mg/m³ (TWA) Cobalt metal dust and fume as Co

-ACGIH Threshold Limit Value (TLV): inorganic cobalt compounds: 0.02 mg/m³ (TWA) as Co,

A3: Animal carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face high efficiency dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Cresol Red****0423**

PRODUCT INFORMATION

Chemical name(s) : Cresol Red
Chinese Name: 甲酚紅
Synonyms: Cresol Red test solution
CAS No: 1733-12-6
Molecular Weight: 382.42
Chemical Formula: $C_{21}H_{18}O_5S$

RISK SYMBOL

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PHYSICAL DATA

Appearance: Clear, deep red solution.
Boiling Point: No information found.
Odor: No information found.
Melting Point: No information found.

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: No information found.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: May form oxides of carbon and sulfur when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities: No information found.
Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: No adverse health effects via inhalation.
Ingestion: Large doses may cause stomach upset.
Skin Contact: No adverse effects expected.
Eye Contact: No adverse effects expected.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation: Not expected to require first aid measures.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact: Not expected to require first aid measures.

Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn.

For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CUMENE****0424**

PRODUCT INFORMATION

Chemical name(s) : CUMENE

Chinese Name: 枯烯, 異丙苯

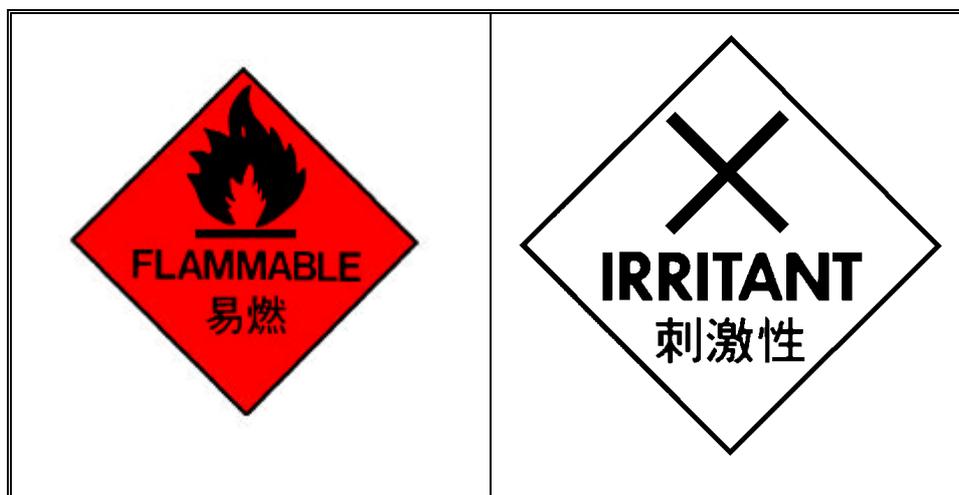
Synonyms: Benzene, (1-methylethyl)-; cumene 99%; cumol; iso-propyl benzene; 2-phenyl propane.

CAS No: 98-82-8

Molecular Weight: 120.20

Chemical Formula: $C_6H_5CH(CH_3)_2$

RISK SYMBOL



PHYSICAL DATA

Appearance: Clear, colorless liquid.

Boiling Point: 152°C (306°F)

Odor: Sharp penetrating aromatic odor.

Melting Point: -96°C (-141°F)

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Solubility: Insoluble in water.
Vapor Density (Air=1): 4.1
Specific Gravity: 0.864
Vapor Pressure (mm Hg): 8 @ 20°C (68°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: 36C (97F) CC
Autoignition temperature: 424C (795F)
Flammable limits in air % by volume:
LEL: 0.9; UEL: 6.5
Flammable Liquid and Vapor!

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Closed containers exposed to heat may explode. Sensitive to static discharge.

Fire Extinguishing Media:

Water spray, dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective. Use water spray to cool fire-exposed containers, to dilute liquid, and control vapor.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Strong oxidizers, nitric acid and sulfur acid. Forms cumene hydroperoxide upon long exposure to air.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

The above information is believed to be accurate to the best of our knowledge.
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Danger! Harmful or fatal if swallowed. Flammable liquid and vapor. Harmful if inhaled or absorbed through skin. Causes irritation to skin, eyes and respiratory tract. Affects central nervous system.

Potential Health Effects

Inhalation:

Vapors or mist irritates the mucous membranes and upper respiratory tract. Affects the central nervous system; symptoms may include dizziness, drowsiness, slight incoordination and unconsciousness.

Ingestion:

Swallowing can cause symptoms of sore throat, coughing, abdominal pain, and vomiting. Central nervous system effects may occur; see inhalation. Swallowing may cause droplets to enter the lungs (aspiration) with the risk of pneumonia. Aspiration can be fatal.

Skin Contact:

May cause skin irritation with redness. Skin absorption can occur; absorption through the skin proceeds slowly.

Eye Contact: Vapor or mist irritates the eyes.

Chronic Exposure:

Prolonged or repeated exposure may cause skin rash. Damage to the lungs, liver, and kidneys may occur.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance. The use of alcoholic beverages enhances the toxic effects.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. Aspiration hazard.

Skin Contact:

In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL): 50 ppm, 245 mg/m³ (TWA) skin
-ACGIH Threshold Limit Value (TLV): 50 ppm (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**O-DICHLOROBENZENE****0425****PRODUCT INFORMATION**

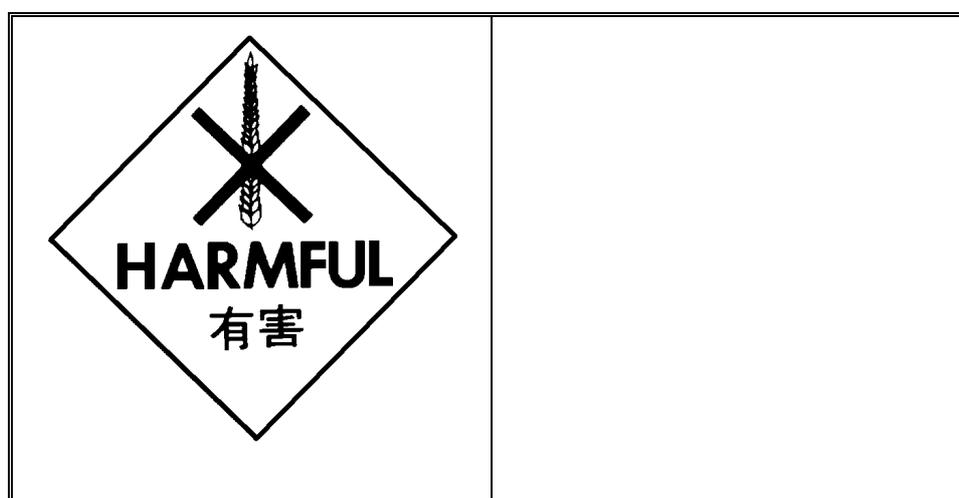
Chemical name(s) : O-DICHLOROBENZENE

Chinese Name: 1,2-二氯苯

Synonyms: 1,2-dichlorobenzene; ortho-Dichlorobenzene; DCB

CAS No: 95-50-1

Molecular Weight: 147.00

Chemical Formula: C₆H₄Cl₂**RISK SYMBOL****PHYSICAL DATA**

Appearance: Colorless to yellowish liquid.

Boiling Point: 180°C (356°F)

Odor: Pleasant odor.

Melting Point: -17.6°C (0°F)

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Solubility: Practically insoluble in water.
Vapor Density (Air=1): 5.1
Specific Gravity: 1.30 @ 20°C/4C
Vapor Pressure (mm Hg): 1.2 @ 20°C (68°F)
pH: No information found.
Evaporation Rate (BuAc=1): < 1
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire:

Flash point: 66°C (151°F) CC
Autoignition temperature: 648°C (1198°F)
Flammable limits in air % by volume:
LEL: 2.2; UEL: 9.2
Combustible.

Explosion: Above flash point, vapor-air mixtures are explosive within flammable limits noted above.

Fire Extinguishing Media:

Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers, aluminum or aluminum alloys.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Danger! Aspiration may cause lung damage. Vapors cause irritation to eyes and respiratory tract. Liquid causes skin irritation and severe eye irritation. Harmful if swallowed, inhaled or absorbed through skin. Affects liver, kidneys and blood. Combustible liquid and vapor. Possible cancer hazard. Contains p-dichlorobenzene which may cause cancer based on animal data. Risk of cancer depends upon duration and level of exposure.

The above information is believed to be accurate to the best of our knowledge.
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Potential Health Effects

Inhalation:

Causes irritation to the respiratory tract. Can cause headache, nausea, swelling around the eyes, runny nose, loss of appetite and weight loss. Higher concentrations may cause drowsiness, central nervous system depression, kidney and liver damage, unconsciousness, and death.

Ingestion:

Toxic! A liver and kidney poison. May cause systemic poisoning with/symptoms paralleling inhalation. May be an aspiration hazard if swallowed.

Skin Contact:

Skin contact causes irritations and possibly burns if contact is repeated or prolonged. May be absorbed through the skin.

Eye Contact:

Vapors cause irritation, redness, and pain. Contact with liquid may cause burning of the eyes and tissue damage.

Chronic Exposure:

Chronic exposure may damage blood, liver and kidneys. P-Dichlorobenzene is a possible carcinogen. Prolonged or repeated skin exposure may cause dermatitis and blisters. Prolonged or repeated exposure through any route may cause symptoms paralleling acute inhalation.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin problems, kidney or liver damage may be more susceptible to the affects of this material.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 50 ppm Ceiling limit for p-Dichlorobenzene: 75 ppm (TWA)
- ACGIH Threshold Limit Value (TLV): 25 ppm (TWA) 50 ppm (STEL), listed as A4, Not classifiable as a human carcinogen for p-Dichlorobenzene: 10 ppm (TWA), listed as A3, animal carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge and dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres. This compound possibly exists in both particulate and vapor phase. A dust/mist prefilter should be used for the particulate.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container. Store in a cool, dry, ventilated area away from sources of heat or ignition. Protect against physical damage. Store separately from reactive or combustible materials, and out of direct sunlight. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**p-DICHLOROBENZENE****0426****PRODUCT INFORMATION**

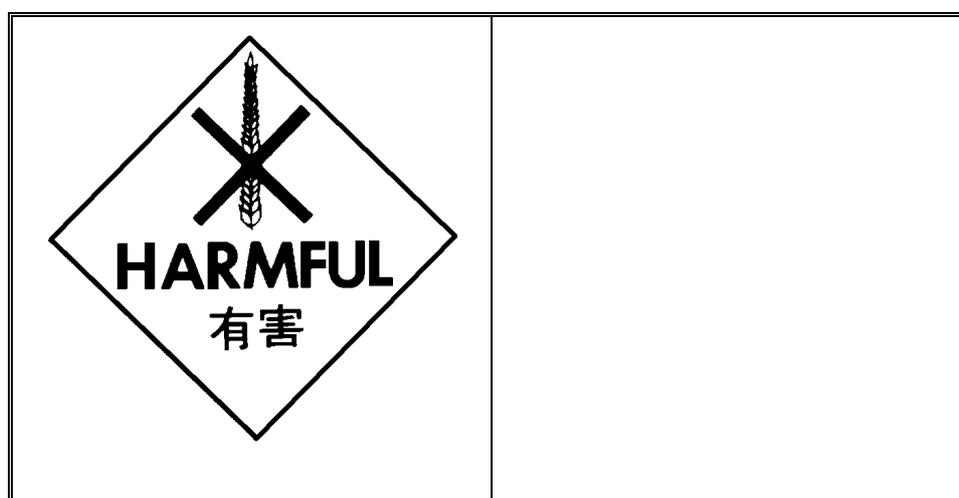
Chemical name(s) : p-DICHLOROBENZENE

Chinese Name: 1,4-二氯苯

Synonyms: 1,4-Dichlorobenzene; para-dichlorobenzene; Paracide; PDCB

CAS No: 106-46-7

Molecular Weight: 147.01

Chemical Formula: C₆H₄Cl₂**RISK SYMBOL****PHYSICAL DATA**

Appearance: White crystals.

Boiling Point: 174°C (345°F)

Odor: Moth-ball odor

Melting Point: 53°C (127°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Practically insoluble in water.
Vapor Density (Air=1): 5.08
Specific Gravity: 1.25 @ 20°C/4C
Vapor Pressure (mm Hg): 10 @ 54.8°C (131°F)
pH: No information found.
Evaporation Rate (BuAc=1): Not applicable.
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire: Flash point: 66C (151F) CC Combustible!
Explosion:
Above the flash point, explosive vapor-air mixtures may be formed.
Contact with strong oxidizers may cause fire.

Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities: Oxidizing agents, aluminum and its alloys.
Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview
Warning! Harmful if swallowed, inhaled or absorbed through skin. Affects the respiratory system, liver, kidneys, eyes, skin and blood. Causes irritation to skin, eyes and respiratory tract. Combustible. Possible cancer hazard. May cause cancer based on animal data.

Potential Health Effects
Inhalation:

Inhalation of dust or vapors can irritate the nose and throat. May also cause headache, swelling around the eyes and runny nose. Can cause loss of appetite, nausea, vomiting, central nervous system effects, weight loss and liver and kidney damage.

Ingestion: Toxic. Swallowing can produce adverse health effects paralleling inhalation.

Skin Contact:

Causes skin irritation, with a slight burning sensation. Red blotching of the skin due to allergic reactions may occur. May be absorbed through the skin; symptoms may parallel inhalation.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure:

Chronic exposure may damage blood, lungs, central nervous system, liver and kidneys. P-Dichlorobenzene is a possible carcinogen.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.

Skin Contact:

Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL): 75 ppm (TWA)

-ACGIH Threshold Limit Value (TLV): 10 ppm (TWA), listed as A3, animal carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the

contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge and dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Storage and use areas should be No Smoking areas. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

=====
ENVIRONMENTAL PROTECTION DATA
=====

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**1, 2-DICHLOROETHANE****0427**

PRODUCT INFORMATION

Chemical name(s) : 1, 2-DICHLOROETHANE

Chinese Name: 1,2-二氯乙烷

Synonyms: Ethylene dichloride; dichloroethylene; 1,2-Bichloroethane

CAS No: 107-06-2

Molecular Weight: 98.96

Chemical Formula: $\text{ClCH}_2\text{CH}_2\text{Cl}$

RISK SYMBOL



PHYSICAL DATA

Appearance: Colorless heavy liquid.

Boiling Point: 83.4°C (181°F)

Odor: Chloroform-like odor.

Melting Point: -35.4°C (-31°F)

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Solubility: 0.81g/100g water @ 20°C (68°F).
Vapor Density (Air=1): 3.42
Specific Gravity: 1.24 @ 20°C
Vapor Pressure (mm Hg): 87 @ 25°C (77°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: 13°C (55°F) CC
Autoignition temperature: 413°C (775°F)
Flammable limits in air % by volume:
LEL: 6.2; UEL: 15.9
Flammable.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Sealed containers may rupture when heated. Contact with strong oxidizers may cause fire. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Darkens on exposure to air or light.

Hazardous Decomposition Products:

Emits toxic fumes of phosgene, hydrogen chloride, acetylene, and vinyl chloride when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Aluminum or magnesium powder, oxidizing agents, reducing agents, organic peroxides, alkali and alkali earth metals, nitric acid, caustics, nitrogen tetroxide, ammonia, and dimethylaminopropylamine.

Conditions to Avoid: Heat, flame, sources of ignition, light and incompatibles.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
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Emergency Overview

Warning! Flammable liquid and vapor. Harmful if swallowed, inhaled or absorbed through skin. Affects central nervous system, liver, kidneys, and cardiovascular system. Causes irritation to skin, eyes and respiratory tract. Possible cancer hazard. May cause cancer based on animal data. Risk of cancer depends on duration and level of exposure.

Potential Health Effects

Inhalation:

Inhalation of vapors irritates the respiratory tract. May cause headache, weakness, cyanosis, nausea, vomiting, and diarrhea. These symptoms may be followed by central nervous system effects, liver damage, kidney damage, adrenal gland damage, cyanosis, weak and rapid pulse and unconsciousness. Death can occur from respiratory and circulatory failure.

Ingestion:

Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. Toxic effects parallel those of inhalation. Doses of 0.5 - 1.0 g/kg can be fatal.

Skin Contact:

Causes irritation, rash and blister formation. Prolonged contact can cause skin burns. Can be absorbed through skin with toxic effects.

Eye Contact:

Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure:

Repeated or prolonged exposure may cause weight loss, low blood pressure, jaundice, reduced urinary output, dermatitis, eye damage and anemia. Dichloroethane is a suspected human carcinogen based on animal data.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, cardiovascular, neurological or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL):
50 ppm (TWA), 100 ppm (ceiling)
200 ppm (max)/5 min/3 hour
- ACGIH Threshold Limit Value (TLV):
10 ppm (TWA), A4 - not classifiable as a human carcinogen
- NIOSH IDLH:
50 ppm

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airtight hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Polyvinyl alcohol (PVA) and Viton are recommended materials for personal protective equipment.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and

recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Sulfur Monochloride****0428**

PRODUCT INFORMATION

Chemical Name. : Sulfur Monochloride

Chinese Name: 二氯化二硫

Chemical Family: Inorganic acid

Synonyms : Sulfur monochloride; Disulfur dichloride; Sulfur chloride

CAS Number : 10025-67-9

Formula : S₂Cl₂

RISK SYMBOL



PHYSICAL DATA

PHYSICAL FORM. : Liquid

COLOR. : Brownish (red-orange)

ODOR. : Pungent, irritating

ODOR THRESHOLD. : 0.001 ppm in air

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MOLECULAR WEIGHT. : 135.03
pH . : Not Applicable
BOILING POINT. : 280 °F (130 °C) @ 1013 mbar
MELTING/FREEZING POINT. : -105 °F (-76 °C)
VISCOSITY. : 0.9 cP @ 77 °F (25 °C)
SOLUBILITY IN WATER . : Reacts
SPECIFIC GRAVITY . : 1.678 @ 68 °F (20 °C)
BULK DENSITY . : Not Established
% VOLATILE BY VOLUME. : 100%
VAPOR PRESSURE . : 14.7 mbar @ 68 °F (20 °C)
VAPOR DENSITY . : Approx. 4.66 (Air = 1)

FIRE AND EXPLOSION DATA

FLASH POINT. : Up to 266 °F (130 °C) no flash point.

FLAMMABLE LIMITS:

UPPER EXPLOSIVE LIMIT (UEL)(%): 32.5 % by volume in air at 1000 mbar.

LOWER EXPLOSIVE LIMIT (LEL)(%): 4.2 % by volume in air at 1000 mbar.

AUTO-IGNITION TEMPERATURE. : 734 °F (390 °C); DIN 51794.

EXTINGUISHING MEDIA. : Carbon Dioxide; Dry Chemical

SPECIAL FIRE FIGHTING PROCEDURES: Sulfur monochloride is not combustible.

However, if sulfur monochloride is involved in a fire, use carbon dioxide or dry chemicals. Firefighters should wear full protective clothing including a self-contained breathing apparatus. Toxic and irritating gases may be present including hydrochloric acid, sulfur dioxide, chlorine, hydrogen disulfide or others. Drums exposed to excessive temperatures can rupture due to the decomposition of sulfur monochloride. Water will react with sulfur monochloride generating irritating gases. However, water spray should be used to keep fire exposed containers cool and to help scrub acid gases from the air.

REACTIVITY DATA

STABILITY. : This is a stable material.

HAZARDOUS POLYMERIZATION. : Will not occur.

INCOMPATIBILITIES. :

Reacts slowly with water, as a skin of sulfur will form at the interfacial boundary. Avoid contact with reducing agents and organic matter. Reacts violently with titanium metal to generate fires. Sulfur monochloride mixtures with organic chemicals must be stored in containers equipped with a pressure relief device. Refer to Section X (special precautions & storage data).

INSTABILITY CONDITIONS. : Excessive temperatures.

DECOMPOSITION TEMPERATURE.: Decomposition begins at 572 °F (300 °C).

DECOMPOSITION PRODUCTS. :

By thermal decomposition: Chlorine, hydrogen disulfide, sulfur dioxide, sulfur. In contact with water: Hydrochloric acid, sulfur dioxide and sulfur.

HEALTH HAZARD DATA

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EMERGENCY OVERVIEW:

[DANGER] Corrosive; Color: Brownish (red-orange); Form: Liquid; Odor: Pungent, irritating; Causes respiratory tract irritation; May be fatal if inhaled; Causes skin burns; Causes eye burns; May cause blindness; Harmful if swallowed; Causes digestive tract burns; Mixtures with organic material can be explosive; Contact with water or moist air liberates irritating gas; Contact with water causes the formation of corrosive material; Reaction with water or foam can be vigorous; Closed container may explode under extreme heat or when contaminated with water; Toxic gases/fumes are given off during burning or thermal decomposition.

POTENTIAL HEALTH EFFECTS:

ROUTE(S) OF ENTRY. : Skin and eye contact, inhalation.

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE:

ACUTE EFFECTS OF EXPOSURE. :

Direct contact with sulfur monochloride can cause burns. It is corrosive to the skin, eyes and mucous membranes. The vapors of sulfur monochloride are strong irritants to the eyes and respiratory tract. Symptoms of exposure include a burning sensation in the eyes and violent coughing. In contact with humid air, hydrogen chloride (HCl) and sulfur dioxide (SO₂) are produced which are themselves irritating. Significant overexposure to sulfur monochloride vapors and its related decomposition products (which could occur if a person is trapped or sprayed) may cause delayed pulmonary edema.

CHRONIC EFFECTS OF EXPOSURE. :

Chronic overexposure to sulfur monochloride can cause symptoms of nonfibrotic lung injury similar to other irritating vapors.

CARCINOGENICITY. : This product is not listed by NTP, IARC or regulated as a carcinogen by OSHA.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE. :

Asthma, other respiratory disorders (bronchitis, emphysema, bronchial hyperreactivity), skin allergies, eczema.

FIRST AID MEASURES

FIRST AID FOR EYES. :

Immediately flush eyes with running water for at least 15 minutes. To assure thorough flushing of all eye tissue, the eyelids should be held apart during irrigation. Permanent eye injury can occur, particularly if rinsing is delayed. Immediately refer to a physician, preferably an eye specialist, for medical treatment.

FIRST AID FOR SKIN. :

Rinse immediately with large amounts of cool, running water. Avoid using hot water and hard rubbing. When splashed with sulfur monochloride, immediately proceed to an emergency shower and begin removing all contaminated clothing while rinsing. Flushing the body with large amounts of water should continue until all of the sulfur monochloride is removed. If the eyes are not contaminated, do not remove safety goggles to avoid washing sulfur monochloride into the eyes. If contact is extensive or burns develop, a physician should be contacted immediately.

FIRST AID FOR INHALATION:

Remove to fresh air. Keep person calm and avoid any unnecessary exertion or movement. Trained persons should administer oxygen if breathing is difficult. If not breathing, give artificial respiration. Immediately contact a physician.

FIRST AID FOR INGESTION:

In case of ingestion, drink copious amounts of water (if available, give several glasses of milk). Do not induce vomiting. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. If vomiting occurs spontaneously, keep airway clear and give more water. Immediately call a physician.

PREVENTATIVE MEASURES

EYE PROTECTION REQUIREMENTS. : Chemical worker safety glasses and full face shield.

SKIN PROTECTION REQUIREMENTS. :

Neoprene, PVC, Polyethylene or Viton (R) gloves, boots and aprons as appropriate for exposure conditions.

VENTILATION REQUIREMENTS:

Use local exhaust or general room ventilation sufficient to prevent overexposure.

RESPIRATOR REQUIREMENTS:

NIOSH approved for acid gases. Do not exceed the use limits of the respirator.

ADDITIONAL PROTECTIVE MEASURES. :

Full body acid resistant suits and positive pressure, self-contained breathing apparatus should be available in case of large spills or other similar emergencies. Emergency showers and eyewash fountains should be located in areas where sulfur monochloride is handled. Educate and train employees in the safe use and handling of this product.

STORAGE TEMPERATURE (MIN/MAX): Ambient/122 °F (50 °C).

SHELF LIFE: Unlimited in closed containers and in the absence of moisture. In drums - one year maximum.

SPECIAL SENSITIVITY: Moisture and heat greater than 122 °F (50 °C).

HANDLING/STORAGE PRECAUTIONS:

This product is extremely corrosive. Do not breathe vapors or mists. Do not get on eyes or on skin. Wash thoroughly after handling. Store containers in a cool, dry and well-ventilated area, out of sunlight and away from fire hazards. Storage containers and associated equipment must be constructed of materials compatible with sulfur monochloride. Do not allow moisture to enter storage containers, as this will cause increased corrosion and release of Hydrochloric Acid and Sulfur Dioxide. Moisture and heat greater than 122 °F (50 °C) will result in build-up of internal pressure in containers. Each storage vessel should be equipped with pressure relief devices which are constructed with materials compatible with sulfur monochloride.

ENVIRONMENTAL PROTECTION DATA

SPILL OR LEAK PROCEDURES. :

Evacuate area and stay upwind. If it is safe to do so, trained personnel should attempt to stop or reduce leak. Large spills should be contained and pumped into salvage drums or other appropriate containers. Full acid resistant suits and self-contained breathing apparatus should be worn during emergency operations. Vapor clouds formed by reaction of the spilled sulfur monochloride with atmospheric moisture can be controlled by water fog or water spray. After bulk of material is removed, large quantities of soda ash, lime or a combination of these can be used to soak up and neutralize the remaining sulfur monochloride. Small spills can be handled by absorption and reacted with large amounts of dry alkali (soda ash and/or lime). Shovel into appropriate container for disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Eosin B****0429**

PRODUCT INFORMATION

Chemical name(s) : Eosin B (C.I. 45400)

Chinese Name: 曙紅-B

Synonyms: CI 45400

CAS No: 548-24-3

Molecular Weight: 624.05

Chemical Formula: $C_{20}H_6Br_2N_2Na_2O_9$

RISK SYMBOL

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PHYSICAL DATA

Appearance: Green to reddish-brown Powder.

Boiling Point: No information found.

Odor: No information found.

Melting Point: 295°C (563°F)

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Solubility: Moderate (1-10%)
Vapor Density (Air=1): Not applicable.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): Not applicable.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not expected to be a fire hazard.
Explosion: None identified.
Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Information:
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Oxides of nitrogen, hydrogen bromide, carbon monoxide, carbon dioxide.

Polymerization: Will not occur.
Incompatibilities: Strong oxidizing agents.
Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview: CAUTION! MAY CAUSE IRRITATION.
Potential Health Effects:
Inhalation: None identified.
Ingestion: None identified.
Skin Contact: Allergic reaction may develop.
Eye Contact: None identified.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

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If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact: In case of contact, flush skin with water.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep container tightly closed. Suitable for any general chemical storage area. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**EOSIN Y****0430****PRODUCT INFORMATION**

Chemical name(s): EOSIN Y

Chinese Name: 曙紅-Y

Synonyms: Acid red 87; CI 45380; Eosin Y Certified (Yellowish); 2',4',5',7'-tetra bromo fluorescein

CAS No: 17372-87-1

Molecular Weight: 691.91

Chemical Formula: $C_{20}H_6Br_4Na_2O_5$ **RISK SYMBOL**

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PHYSICAL DATA

Appearance: Brown powder.

Boiling Point: No information found.

Odor: Odorless.

Melting Point: No information found.

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Solubility: Soluble in water.
Vapor Density (Air=1): No information found.
Specific Gravity: Unknown
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Burning may produce carbon monoxide, carbon dioxide, nitrogen oxides. Combustion will produce carbon dioxide, carbon monoxide, hydrogen bromide gas.
Hazardous Polymerization: Will not occur.
Incompatibilities: Strong oxidizers.
Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Caution! May irritate eyes, respiratory tract.
Potential Health Effects
Inhalation: Inhalation of dust may cause irritation to the respiratory tract.
Ingestion: Not expected to be a health hazard via ingestion.
Skin Contact: Not expected to cause any adverse health effects from skin contact.
Eye Contact: May cause irritation.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Not expected to require first aid measures. If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ERIOCHROME BLACK T****0431**

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PRODUCT INFORMATION

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Chemical name(s) : ERIOCHROME BLACK T

Chinese Name: <羊毛>鉻黑 T

Synonyms: Moderate Black II; CI 14645; Eriochrome Black T Supra

CAS No: 1787-61-7

Molecular Weight: 461.38

Chemical Formula: $C_{20}H_{12}O_7N_3SNa$

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RISK SYMBOL=====

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PHYSICAL DATA

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Appearance: Black powder.

Boiling Point: Not applicable.

Odor: Odorless.

Melting Point: No information found.

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Moderate solubility in water.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Burning may produce carbon monoxide, carbon dioxide, sulfur oxides, and nitrogen oxides.
Hazardous Polymerization: Will not occur.
Incompatibilities: Strong oxidizers.
Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Toxicological properties unknown. As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects: The toxicological properties of this material have not been investigated.

Inhalation: No information found.
Ingestion: No information found.
Skin Contact: No information found.
Eye Contact: No information found.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion: If large amounts were swallowed, give water to drink and get medical advice.
Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ETHYL PROPIONATE****0432****PRODUCT INFORMATION**

Chemical name(s) : ETHYL PROPIONATE

Chinese Name: 丙酸乙酯

Synonyms: Propanoic acid, ethyl ester

CAS No: 105-37-3

Molecular Weight: 102.13

Chemical Formula: C₅H₁₀O₂**RISK SYMBOL****PHYSICAL DATA**

Appearance: Water white liquid.

Boiling Point: 99°C (210°F)

Odor: Pineapple-like odor.

Melting Point: -73°C (-99°F)

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Solubility: Soluble in water.
Vapor Density (Air=1): 3.52
Specific Gravity: 0.891
Vapor Pressure (mm Hg): 40 @ 27.2°C (81°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire:

Flash point: 12°C (54°F) CC
Autoignition temperature: 475°C (887°F)
Flammable limits in air % by volume:
LEL: 1.8; UEL: 11
Flammable Liquid

Explosion: Above flash point, vapor-air mixtures are explosive within flammable limits noted above.

Fire Extinguishing Media:

Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Oxidizing agents, bases, acids, moisture.

Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

Warning! Flammable liquid. Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract.
May have narcotic effects.

Potential Health Effects

Inhalation:

Vapors can irritate the respiratory tract. May cause shortness of breath, coughing. High concentrations may have a narcotic effect.

Ingestion: Harmful if swallowed. May cause abdominal pain, vomiting.

Skin Contact: May cause skin irritation with redness.

Eye Contact: Vapors are irritating to the eyes causing redness and pain.

Chronic Exposure: Overexposures may have a narcotic effect.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

Material Safety Data Sheet

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MSDS**ETHYLENE****0433**

PRODUCT INFORMATION

Product Identifier: ETHYLENE
Chinese Name: 乙炔
Application and Use: Chemical feedstock.
Product Description: Olefinic hydrocarbon
CAS number: 74-85-1

RISK SYMBOL



PHYSICAL DATA

Physical State: Gas
Spec. Gravity: 0.35 at 15.5°C
Vap. Pres.: 5,168 kPa at 10°C
Solubility in Water: 0.01% at 20°C
Boiling Point: -104°C

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Freezing/Melting Point.: -169°C
Viscosity: 0.4 cST at -50°C Approximate
Vapour Density (air=1): 0.98
Molecular Wt: 28
pH: Not applicable.
Odour: Faint sweet odor
Appearance: Colorless gas

FIRE AND EXPLOSION DATA

Flashpoint and Method: -100°C ASTM D56 Estimate; gas
Autoignition Temperature: 450°C
Flammable Limits: 2.3 to 32.4 % by volume

GENERAL HAZARDS:

Extremely flammable; material will readily ignite at normal temperatures. Flammable Gas; may readily form flammable mixtures at or above the flash point. Unstable material; will vigorously polymerize, decompose, condense or will become self reactive under conditions of shocks, pressure or temperature. Auto-refrigeration; drains may become plugged and valves may become inoperable because of the formation of ice due to expanding vapours or vapourizing liquids.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel. Shut off fuel to fire if possible to do so without hazard. If a leak or spill has not ignited use water spray to disperse the vapours. Do not extinguish flames at leak because possibility of uncontrolled explosive re-ignition exists. Cut off fuel and/or allow fire to burn out. Extinguish small residual fires with dry chemical powder or water spray. Try to cover liquid spills with foam. A self-contained breathing apparatus (SCBA) is recommended for indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA is optional.

HAZARDOUS COMBUSTION PRODUCTS: No unusual

REACTIVITY DATA

GENERAL:

Product is unstable and will vigorously polymerize, decompose, condense, or become self-reactive under conditions of shock, pressure, or temperature.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Inorganic acids, organic acids, molten sulfur, halogens, halogenated compounds, nitrogen dioxide, carbon tetrachloride, ozone, nitromethane, aluminum chloride, oxidizing agents

CONDITIONS TO AVOID INSTABILITY: Contamination can cause self-reaction.

HAZARDOUS DECOMPOSITION: None

HEALTH HAZARD DATA

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INHALATION:

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects. Causes suffocation (asphyxiant) if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels.

EYE CONTACT:

Exposure to rapidly expanding gas or vapourizing liquids may cause frostbite (cold burns) or tissue damage.

SKIN CONTACT:

Exposure to rapidly expanding gas or vapourizing liquid may cause frostbite (cold burn). In case of frostbite, place affected area in warm water until circulation returns.

INGESTION: Not considered to be a hazard.

CHRONIC:

The International Agency for Research on Cancer (IARC) has evaluated ethylene and has concluded that there is inadequate evidence in humans or in experimental animals for the carcinogenicity of ethylene. Ethylene is unclassifiable as to its carcinogenicity to humans (IARC Group 3). Available evidence from the literature on the toxicity of ethylene indicates that exposure to ethylene has no adverse effects on reproduction or on the developing fetus.

FIRST AID MEASURES

INHALATION:

In emergency situations use proper respiratory protection to immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

In case of cold burns (frostbite) caused by rapidly expanding gas or vapourizing liquids, get medical attention promptly.

SKIN CONTACT:

In case of cold burns caused by rapidly expanding gas or vapourizing liquid, get prompt medical attention.

INGESTION: First aid is not applicable.

PREVENTATIVE MEASURES

PERSONAL PROTECTION:

Gloves and safety glasses should be worn. Where it is likely that frostbite hazards may occur from vaporizing liquid and expanding vapor, prevent contact with eyes and skin. Wear safety glasses with side shields, long sleeves and insulating gloves. Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a lab hood. Provide mechanical ventilation of confined spaces. Use explosion-proof ventilation equipment.

ELECTROSTATIC ACCUMULATION HAZARD: Yes, use proper grounding procedure.

HANDLING, STORAGE AND SHIPPING:

Keep container closed. Handle and open containers with care. Store in a cool, well ventilated place away from incompatible materials. DO NOT handle or store near an open flame, heat, or other sources of ignition. Protect material from direct sunlight. Material will accumulate static charges which may cause an electrical spark (ignition source). Use proper grounding procedures. DO NOT pressurize, cut, heat, or weld containers. Empty product containers may contain product residue. DO NOT reuse empty containers without commercial cleaning or reconditioning.

ENVIRONMENTAL PROTECTION DATA

SPILL CONTROL AND DISPOSAL:

Consult an expert on the disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse effects of the spill.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard. Allow to evaporate.

WATER SPILL:

Eliminate sources of ignition. Warn occupants and shipping in surrounding and downwind areas of fire and explosion hazard and request all to stay clear. Allow to evaporate from surface.

Material Safety Data Sheet

City University of Hong Kong

MSDS**FLUORESCCEIN****0434**

PRODUCT INFORMATION

Chemical name(s) : FLUORESCCEIN USP

Chinese Name: 荧光黄, 荧光素

Synonyms:

Spiro[isobenzofuran-1(3H),9'-[9H]xanthen]-3-one, 3',6'-dihydroxy-; Fluorescein USP; CI Acid Yellow 73; Soap Yellow; CI 45350

CAS No: 2321-07-5

Molecular Weight: 332.32

Chemical Formula: C₂₀H₁₂O₅

RISK SYMBOL

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PHYSICAL DATA

Appearance: Yellowish-red to red powder

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Boiling Point: No information found.
Odor: No information found.
Melting Point: 314 - 316°C (597 - 601°F) Decomposes.
Solubility: Insoluble in water.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities: Strong oxidizers.
Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Warning! May cause allergic skin or respiratory reaction.
Potential Health Effects
Inhalation: May cause allergic reaction in sensitive individuals.
Ingestion: May cause allergic reaction in sensitive individuals.
Skin Contact: May cause allergic reaction in sensitive individuals.
Eye Contact: May cause allergic reaction in sensitive individuals.
Chronic Exposure: Chronic exposures may cause allergic reaction.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact:

Immediately flush skin with plenty of soap and water. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**GELATIN****0435**

PRODUCT INFORMATION

Chemical name(s) : GELATIN

Chinese Name: 明膠

Synonyms: Gelatine; Gelfoam; Puragel

CAS No: 9000-70-8

Molecular Weight: Not applicable.

Chemical Formula: Not applicable.

RISK SYMBOL

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PHYSICAL DATA

Appearance: Off-white to tan flakes or powder.

Boiling Point: Decomposes above 100°C; Complete combustion above 500°C.

Odor: Odorless.

Melting Point: No information found.

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Solubility: Insoluble in cold water, soluble in warm water.
Vapor Density (Air=1): No information found.
Specific Gravity: 1.2
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.
Minimum dust cloud ignition temperature: 620°C (1147°F).

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Minimum explosible concentration: < 0.5 g/l (air)

Maximum explosion pressure: 78 lb./sq. in.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Tannin, formaldehyde.

Conditions to Avoid: Moisture, heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Warning! May form combustible dust concentrations in air.

Potential Health Effects

Inhalation: No adverse health effects expected from inhalation.

Ingestion: Large doses may cause gastro-intestinal upset.

Skin Contact: No adverse effects expected.

Eye Contact: No adverse effects expected but dust may cause mechanical irritation.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 15 mg/m³ total dust, 5 mg/m³ respirable fraction for nuisance dusts.

- ACGIH Threshold Limit Value (TLV):

10 mg/m³ total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System: Not expected to require any special ventilation.

Personal Respirators (NIOSH Approved): Not expected to require personal respirator usage.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Safety glasses.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

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MSDS**ADIPIC ACID****0436****PRODUCT INFORMATION**

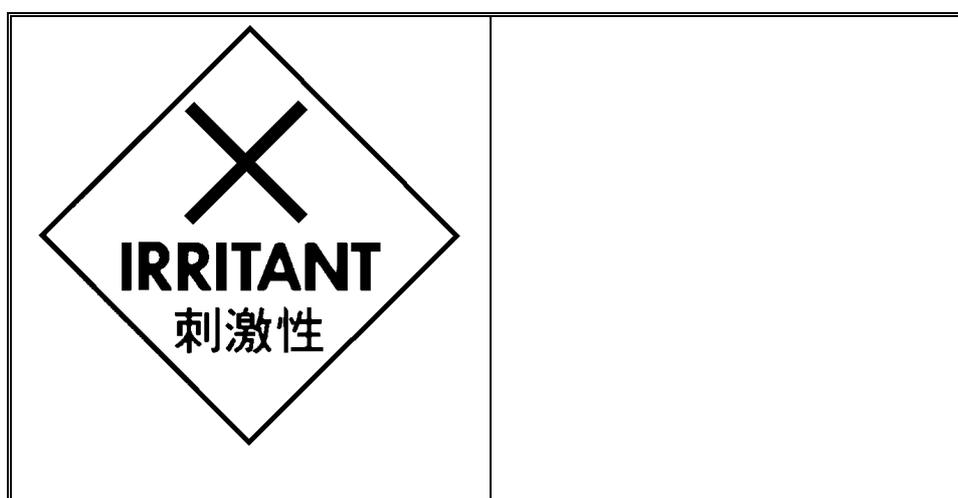
Chemical name(s) : ADIPIC ACID

Chinese Name: 肥酸, 己二酸

Synonyms: Hexanedioic acid; 1, 4-butanedicarboxylic acid.

CAS No: 124-04-9

Molecular Weight: 146.14

Chemical Formula: C₆H₁₀O₄**RISK SYMBOL****PHYSICAL DATA**

Appearance: White crystals.

Boiling Point: 337°C (639°F) @ 760 mm Hg (Decomposes)

Odor: Odorless.

Melting Point: 152°C (306°F)

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Solubility: Slightly soluble in water.
Vapor Density (Air=1): 5.04
Density: 1.36
Vapor Pressure (mm Hg): 1 @ 159.5°C (320°F)
pH: 3.2 (0.1% aq. soln.) @ 25°C
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Flash point: 196°C (385°F) CC
Autoignition temperature: 420°C (788°F)
Slight fire hazard when exposed to heat or flame.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Minimum explosible concentration in air (dust): 10-15 mg/L.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Can react with oxidizing materials.

Conditions to Avoid: Air, heat, and dusting conditions.

HEALTH HAZARD DATA

Emergency Overview

Caution! Causes moderate eye irritation. May cause irritation to skin and respiratory tract. May be harmful if swallowed or inhaled. May form combustible dust concentrations in air.

Potential Health Effects

Inhalation:

Inhalation of dust may irritate the respiratory tract. May cause coughing and sneezing.

Ingestion: Based on animal data, this material is presumed to be only slightly toxic.

Skin Contact: May irritate the skin. Prolonged or repeated skin contact may cause dermatitis.

Eye Contact: Causes moderate eye irritation with redness and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Do not induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: - ACGIH Threshold Limit Value (TLV): 5 mg/m³ (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Rubber gloves and lab coat, apron or coveralls.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Avoid dust formation and control ignition sources. Employ grounding, venting and explosion relief provisions in accord with accepted engineering practices in any process capable of generating dust and/or static electricity. Empty only into inert or non-flammable atmosphere. Emptying contents into a non-inert

atmosphere where flammable vapors may be present could cause a flash fire or explosion due to electrostatic discharge.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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Material Safety Data Sheet

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MSDS**Adipyl Chloride****0437**

PRODUCT INFORMATION

Chemical name(s) : Adipyl Chloride

Chinese Name: 己二[®]氯

Synonyms: None

CAS No: 111-50-2

Molecular Weight: 183.03

Chemical Formula: ClCO(CH₂)₄COCl

RISK SYMBOL



PHYSICAL DATA

Appearance: Yellow liquid.

Boiling Point: 126°C (259°F) (pure) at 12mm Hg

Odor: No information found.

Melting Point: No information found.

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Solubility: Decomposes
Vapor Density (Air=1): No information found.
Specific Gravity: 1.26
Vapor Pressure (mm Hg): Not applicable.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire: Flash point: 110°C (230°F) CC
Explosion: Fire or excessive heat may produce hazardous decomposition products.
Fire Extinguishing Media: Water, dry chemical, foam or carbon dioxide.
Special Information:
Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Use water with caution. Reacts with water.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Carbon dioxide, carbon monoxide, Hydrogen chloride gas
Hazardous Polymerization: Will not occur.
Incompatibilities: Strong oxidizing agents. Strong bases. water, alcohols.
Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

Danger! Water reactive. Combustible. May cause a fire. Corrosive. Causes severe burns to eyes, skin and respiratory tract. Contact with water may form toxic gas. The toxicological properties of this material have not been investigated.

Potential Health Effects

Inhalation: None identified.
Ingestion: None identified.
Skin Contact: None identified.
Eye Contact: None identified.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:

There is insufficient data in the published literature to assign complete numerical SAF-T-DATA* ratings and laboratory protective equipment for this product. Special precautions must be used in storage, use and handling. Protective equipment for laboratory bench use should be chosen using professional judgment based on the size and type of reaction or test to be conducted and the available ventilation, with overriding consideration to minimize contact with the chemical.

Handling and Storage:

Keep container tightly closed and away from water or alcohols. Do not add water to a closed container. Reaction may result in violent rupture of the container. Keep from contact with oxidizing materials. Containers of this

material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Absorb material in sand or other suitable absorbent and place in container.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

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MSDS**HEXYL ALCOHOL****0438****PRODUCT INFORMATION**

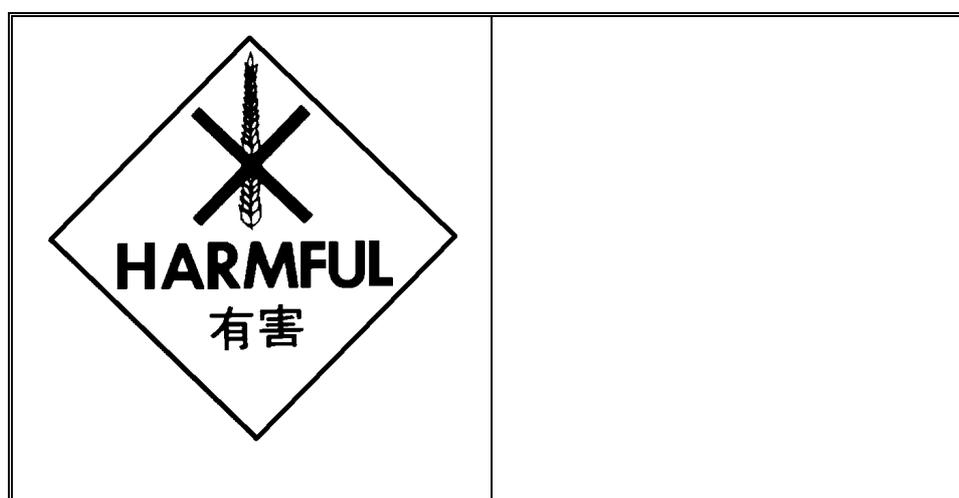
Chemical name(s) : HEXYL ALCOHOL

Chinese Name: 己醇-[1]

Synonyms: 1-Hexanol; hexanol; n-hexanol; Amyl carbinol; Caproyl alcohol

CAS No: 111-27-3

Molecular Weight: 102.18

Chemical Formula: $\text{CH}_3(\text{CH}_2)_4\text{CH}_2\text{OH}$ **RISK SYMBOL****PHYSICAL DATA**

Appearance: Clear, colorless liquid.

Boiling Point: 156.5°C (313°F)

Odor: Characteristic fruity odor.

Melting Point: -52°C (-62°F)

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Solubility: Slightly soluble in water.
Vapor Density (Air=1): 3.5
Specific Gravity: 0.82
Vapor Pressure (mm Hg): 1 @ 24.4°C (75°F)
pH: No information found.
Evaporation Rate (BuAc=1): 0.05
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: 63°C (145°F)
Autoignition temperature: 290°C (554°F)
Flammable limits in air % by volume:
LEL: 1.2; UEL: 7.7
Combustible Liquid and Vapor!

Explosion: Above flash point, vapor-air mixtures are explosive within flammable limits noted above.

Fire Extinguishing Media: Dry chemical, alcohol foam or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: Heat, ignition sources and incompatibilities.

HEALTH HAZARD DATA

Emergency Overview

Warning! Harmful if swallowed, inhaled or absorbed through skin. Causes irritation to skin, eyes and respiratory tract. Affects central nervous system. Combustible liquid and vapor.

Potential Health Effects

Inhalation:

Inhalation of vapor or mist is irritating to the mucous membrane and upper respiratory tract. May have central nervous system effects.

Ingestion: Harmful if swallowed. May cause headache, nausea, drowsiness and dizziness.

Skin Contact: Causes irritation. May be absorbed through skin.

Eye Contact:

Causes eye irritation with redness, tearing. Splashes have caused temporary corneal damage.

Chronic Exposure: Prolonged skin contact may result in drying and cracking of the skin.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Wash clothes before reuse. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Storage and use areas should be No Smoking areas. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Hydrogen gas****0439**

PRODUCT INFORMATION

Chemical Name: HYDROGEN

Chinese Name: 氫

Synonym: Hydrogen gas

Chemical Name: Not applicable.

Chemical Family: Not available.

Chemical Formula: H₂

CAS #: 1333-74-0

Material Uses: Fuel gas, feedstock and hydrogenation

RISK SYMBOL



PHYSICAL DATA

Physical state and appearance: Gas

Odor: Odourless

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Taste: Tasteless.
Color: Colourless gas
pH (1% soln/water): Not applicable.
Boiling Point: -252.8°C (-423°F)
Melting Point: -259.2°C (-435°F)
Softening Point: Not applicable.
Specific Gravity: Not applicable
Evaporation Rate: Not applicable.
Vapor Pressure: Not available.
Vapor Density: 0.0695
Volatility: 100%
Odor Threshold : Not applicable.
Water/Oil Dist. Coeff.: Not available
Ionicity (in Water): Not available.
Dispersion Properties: Not available.
Solubility : Slight

FIRE AND EXPLOSION DATA

The product is: Flammable.
Auto-Ignition Temperature: 571.2°C (1060°F)
Flash Points : Flammable gas
Flammable Limits: Lower Explosive Level: 4.0% Upper Explosive Level: 75.0%
Products of Combustion: water
Fire Fighting Media and Instructions:
Let fire burn until gas flow can be shut off. Use water spray to keep fire-exposed containers cool.

Special Remarks on Fire Hazards:
Container explosion may occur under fire conditions or when heated. May burn with invisible flame.

Special Remarks on Explosion Hazards: Extremely flammable.
Fire Hazards in Presence of Various Substances:
Exposure to heat/flame. Reacts vigorously with oxidizing agents.

Explosion Hazards in Presence of Various Substances:
Highly explosive in presence of open flames and sparks.

REACTIVITY DATA

Stability: The product is stable.
Conditions of Instability: Not applicable.
Incompatibility with various substances:
Yes Halogen compounds, platinum, lithium, nitrogen trifluoride, oxygen difluoride

Hazardous Polymerization: Will not occur.
Corrosivity: Not considered to be corrosive.
Hazardous Decomposition Products: None

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Special Remarks on Reactivity: Reacts vigorously with oxidizing agents
Special Remarks on Corrosivity: No additional remark.

HEALTH HAZARD DATA

Emergency Overview

Hydrogen is a compressed flammable gas that is highly volatile. Exposure to the gas can cause dizziness, light-headedness and unconsciousness. Excessive amounts in the air in an enclosed space will decrease the amount of oxygen and may cause suffocation. Primary health concern is displacement of oxygen in air. **FLAMMABLE**. May burn with invisible flame.

Potential Acute Health Effects

Simple asphyxiant and mild anesthetic. Symptoms of progressively lower levels of available oxygen include dizziness, drowsiness, headache, coughing, tearing of the eyes, nausea, fatigue, errors in judgement, excitation, rapid pulse, gasping, confusion, giddiness, irregular heartbeat, decreased blood pressure, convulsions and death.

Potential Chronic Health Effects

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS:

Not available. Toxicity of the product to the reproductive system: Not available. There is no known effect from chronic exposure to this product. Repeated or prolonged exposure is not known to aggravate medical condition.

FIRST AID MEASURES

Eye Contact: In case of contact with eyes, rinse immediately with plenty of water.

Skin Contact: Not normally expected to present a skin hazard.

Hazardous Skin Contact: No additional information.

Inhalation: Remove to fresh air. Assist breathing if required. Obtain medical attention.

Hazardous Inhalation: No additional information.

Ingestion: Not applicable.

Hazardous Ingestion: No additional information.

Notes to Physician

Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient. After adequate first aid, patient should be monitored to determine if symptoms reappear.

PREVENTATIVE MEASURES

Engineering Controls:

Engineering control methods to reduce hazardous exposure are preferred. Methods include mechanical ventilation (dilution and local exhaust), process or personal enclosure, control of process conditions, and process

modification. Administrative controls and personal protective equipment may also be required. Maintain the concentration of hydrogen below 10% of the LEL. Use a non-sparking grounded ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside. Supply sufficient replacement air to make up for air removed by exhaust systems.

Personal Protection

Eyes: Safety glasses.

Body: Flame and spark resistant

Respiratory: Not required with adequate ventilation

Hands: No special protective clothing is required.

Feet: Appropriate safety footwear

Remarks on Personal Protection:

Personal protective equipment (PPE) must not be considered a long term solution to exposure control. PPE must be accompanied by employer programs to properly select, maintain, clean, fit and use equipment. Consult a competent industrial hygiene resource to determine hazard potential and/or the PPE manufacturers and applicable regulations to ensure adequate protection.

Precautions: Avoid contact with skin and eyes. Keep away from sources of ignition. Keep away from incompatibles.

Incompatibility: Yes Halogen compounds, platinum, lithium, nitrogen trifluoride, oxygen difluoride

Storage:

Store in a cool, dry location away from ignition sources, sunlight and incompatible materials. Consider leak detection and alarm equipment for storage area.

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ENVIRONMENTAL PROTECTION DATA
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Small Spill:

Isolate spill or leak area for 50-100 meters (165-320 feet). Eliminate all potential ignition sources. Evacuate unprotected personnel to upwind of the spill area. Warn and evacuate, if necessary, personnel/occupants of explosion potential. Spill response personnel who are required to enter the spill area must wear SCBA and other appropriate protective equipment.

Large Spill:

Flammable gas. Let evaporate. Consider downwind evacuation for 300 meters (1000 feet). Shut off all ignition sources; no flares, smoking, or flames in hazard area. Shut off main gas valve.

Personal Protection in Case of a Large Spill:

Isolate area until gas has dispersed. If involved in fire, shut off flow immediately if it can be done without risk.

Material Safety Data Sheet

City University of Hong Kong

MSDS

Hydrogen Chloride, Anhydrous

0440

PRODUCT INFORMATION

CHEMICAL NAME : Hydrogen Chloride, Anhydrous
Chinese Name: 氯化氢
CHEMICAL FAMILY : Inorganic Acid; Corrosive Gas
SYNONYMS : Anhydrous Hydrochloric Acid
CAS NUMBER : 7647-01-0

RISK SYMBOL



PHYSICAL DATA

PHYSICAL FORM : Gas

APPEARANCE :

Colorless, corrosive, acidic, nonflammable gas; characteristic, suffocating, pungent odor. This material fumes strongly in moist air.

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COLOR : Colorless
ODOR : Suffocating - pungent (irritating)
ODOR THRESHOLD : 1 - 5 ppm
MOLECULAR WEIGHT : 36.46
pH : Anhydrous, forms strong acid on contact with moisture.
BOILING POINT : -121 °F (-85 °C)
MELTING/FREEZING POINT : -175 °F (-115 °C)
SOLUBILITY IN WATER : 82.3% @ 0 °C (Complete)
SPECIFIC GRAVITY : 1.187 @ -85 °C
BULK DENSITY : Not Established
% VOLATILE BY VOLUME . : Not Applicable
% VOLATILE BY WEIGHT . : Not Applicable
EVAPORATION RATE : Not Applicable (Butyl acetate = 1)
VAPOR PRESSURE : 3040 mmHg @ 17.8 °C
VAPOR DENSITY : 1.268 (Air = 1)

FIRE AND EXPLOSION DATA

FLASH POINT : Non-Combustible Material

FLAMMABLE LIMITS:

UPPER EXPLOSIVE LIMIT (UEL)(%): Not Established

LOWER EXPLOSIVE LIMIT (LEL)(%): Not Established

AUTO-IGNITION TEMPERATURE : Not Established

EXTINGUISHING MEDIA : Water; Foam; Dry Chemical

SPECIAL FIRE FIGHTING PROCEDURES:

In the presence of water, hydrogen chloride can react with certain metals such as iron to produce highly flammable and explosive hydrogen gas. If hydrogen gas is produced, direct all fire-fighting techniques at it. If cylinders of hydrogen chloride are in the fire area, remove them if feasible, or cool them with a water spray to prevent the release of the hydrogen chloride. Firefighters must wear a self-contained breathing apparatus and full protective turn-out gear (Bunker gear).

REACTIVITY DATA

STABILITY: This is a stable material.

HAZARDOUS POLYMERIZATION: Will not occur.

INCOMPATIBILITIES:

Hydrogen chloride gas is a very reactive, acidic, corrosive gas. Incompatibles: cyanides, metals, amines, bases, metal carbide, oxidizing materials, acids, halo carbon, combustible materials, halogens, metal salts.

INSTABILITY CONDITIONS:

Avoid exposure to incompatible chemicals and to any other material whose compatibility with hydrogen chloride has not yet been established. Prevent accidental water contamination of any system that contains this material because it becomes corrosive to many metals in the presence of moisture. The corrosive action can liberate extremely flammable/explosive hydrogen gas. Avoid contact with organic materials such as ethylene, exothermic reactions are likely. Avoid excessive heat.

DECOMPOSITION PRODUCTS:

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Hydrogen gas is generated in contact with many metals. Contact with strong oxidizers may produce chlorine gas.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

[WARNING] Corrosive; Color: Colorless; Form: Gas; Colorless, corrosive, acidic, nonflammable gas; characteristic, suffocating, pungent odor. This material fumes strongly in moist air. Odor: Suffocating - pungent (irritating); May cause eye, skin, and respiratory tract burns; May be fatal if inhaled; May cause blindness; Causes digestive tract burns; Contact with metals liberates flammable gas; Toxic gases/fumes are given off during burning or thermal decomposition.

POTENTIAL HEALTH EFFECTS:

ROUTE (S) OF ENTRY: Skin Contact; Eye Contact; Inhalation

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE:

ACUTE INHALATION:

Inhalation of gas or fumes at levels of 5 - 35 ppm may cause irritation and burning of the throat, coughing and choking. Levels at 50 - 100 ppm may be barely tolerable for 1 hour. High levels may cause inflammation and occasionally ulceration of the nose, throat or larynx, bronchitis, pneumonia, palpitations and headache. Higher concentrations may cause necrosis of the tracheal and bronchial epithelium, emphysema, damage to pulmonary blood vessels and lesions of the liver and other organs. Death may be due to laryngeal spasm, bronchopneumonia or pulmonary edema. At levels of 1300 - 2000 ppm may be dangerous, even on brief exposures.

CHRONIC INHALATION:

Repeated or prolonged exposure may cause erosion and discoloration of exposed teeth, chronic bronchitis and gastritis.

ACUTE SKIN CONTACT:

Contact may cause severe irritation, inflammation, ulceration, necrosis and chemical burns. Photosensitization reactions may occur in persons previously exposed.

CHRONIC SKIN CONTACT: Repeated or prolonged contact may cause dermatitis. Photosensitization may occur.

ACUTE EYE CONTACT:

Contact may cause severe irritation, conjunctivitis, corneal necrosis and burns with impairment or permanent loss of vision.

CHRONIC EYE CONTACT:

Effects are dependent upon concentration and duration of exposure. Conjunctivitis or effects similar to those for acute exposure may occur.

ACUTE INGESTION:

This is not a likely route of exposure. However, ingestion may cause burns of the mouth, throat, esophagus and stomach with pain, nausea, salivation, vomiting, diarrhea, chills, shock and intense thirst. Nephritis, fever and perforation of the intestinal tract, and circulatory collapse may occur.

CHRONIC INGESTION: None reported.

CARCINOGENICITY: This product is not listed by NTP, IARC or regulated as a carcinogen by OSHA.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE. :

Asthma, other respiratory disorders (bronchitis, emphysema, bronchial hyperactivity), skin allergies, eczema.

FIRST AID MEASURES

FIRST AID FOR EYES:

Immediately flush eyes with running water for at least 15 minutes. To assure thorough flushing of all eye tissue, the eyelids should be held apart during irrigation. Permanent eye injury can occur, particularly if rinsing is delayed. Refer to a physician immediately.

FIRST AID FOR SKIN:

Rinse with large amounts of running water while removing contaminated clothing, jewellery and shoes. Continue washing with soap or mild detergent and large amounts of water for at least 15 - 20 minutes until no evidence of the chemical remains. Avoid using hot water and hard rubbing. If burning starts, the skin should be covered with sterile gauze. If contact is extensive or burns develop, a physician should be contacted immediately. Wash clothing before reuse.

FIRST AID FOR INHALATION:

Immediately remove to fresh air if breathing is difficult. Administer oxygen if breathing is difficult. If not breathing, give artificial respiration. Use a bag valve mask or similar device to perform artificial respiration. Immediately contact a physician.

FIRST AID FOR INGESTION:

Do not induce vomiting. If the person is conscious, give large amounts of water or milk. Allow vomiting to occur. When vomiting occurs, keep head lower than hips to help prevent aspiration of fluid into the lungs. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. Contact a physician immediately.

NOTE TO PHYSICIAN: Treat symptomatically and supportively.

PREVENTATIVE MEASURES

EYE PROTECTION REQUIREMENTS:

Splash-proof safety goggles and a faceshield to prevent contact is recommended. Contact lenses pose a special hazard. Do not wear contact lenses in any work area. Soft lenses absorb irritant, all lenses concentrate them.

SKIN PROTECTION REQUIREMENTS :

Acid resistant coats, overalls and gloves to prevent contact with this substance.

VENTILATION REQUIREMENTS :

Provide local and general maximum-explosion proof exhaust or process enclosure ventilation to maintain levels below the recommended exposure limit. Make ventilation system ductwork and exposed fan components acid resistant.

RESPIRATOR REQUIREMENTS :

Fullface NIOSH/MSHA approved respirator for acid gases. Do not exceed the working limits of the respirator. At 50 ppm you can use any chemical cartridge respirator with cartridge (s) providing protection against this substance; any air-purifying respirator with a full facepiece and a canister providing protection against this substance; any

powered, air-purifying respirator with cartridge providing protection against this substance; any supplied-air respirator; any self-contained breathing apparatus with a full facepiece.

ADDITIONAL PROTECTIVE MEASURES:

Eye wash and safety showers should be immediately available. Full acid suits and NIOSH/MSHA approved self contained breathing apparatus should be readily available to handle major spills.

STORAGE TEMPERATURE (MIN/MAX): Ambient

SHELF LIFE : Not Established

SPECIAL SENSITIVITY : Moisture and high heat.

HANDLING/STORAGE PRECAUTIONS:

Store and handle in accordance with all current regulations and standards. Subject to storage regulations: US OSHA 29 CFR 1910.101. Protect from physical damage. Store in a cool, dry place. Ventilation required. Keep separated from incompatible substance. Make sure all engineering systems (production, transportation) are of maximum-explosion-proof design. Ground and bond all containers, pipelines, etc., Used in shipping, transferring, reacting, producing, and sampling operations to prevent static sparks.

ENVIRONMENTAL PROTECTION DATA

SPILL OR LEAK PROCEDURES :

Treat any hydrogen chloride gas leak as an emergency. Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately (hydrogen gas may be generated), and provide adequate ventilation. Cleanup personnel must wear a full set of protective clothing (acid suit), including a self-contained breathing apparatus. If it is safe to do so, trained personnel should attempt to reduce or stop leak. Large spills should be contained and pumped into tanks which have been constructed for HCl service. A water fog or spray should be used to control vapors. Flush spill area with plenty of water and neutralize washings with lime or soda ash. Do not flush to sewers. Collect for proper disposal. Adhere to federal, state and local regulations on reporting releases. Small spills can be handled by absorption, and reacted with large amounts of dry alkali (soda ash or lime). Absorbed and reacted material can then be shoveled into containers and disposed of.

Material Safety Data Sheet

City University of Hong Kong

MSDS**HYDROGEN SULFIDE****0441**

PRODUCT INFORMATION

Chemical name: HYDROGEN SULFIDE

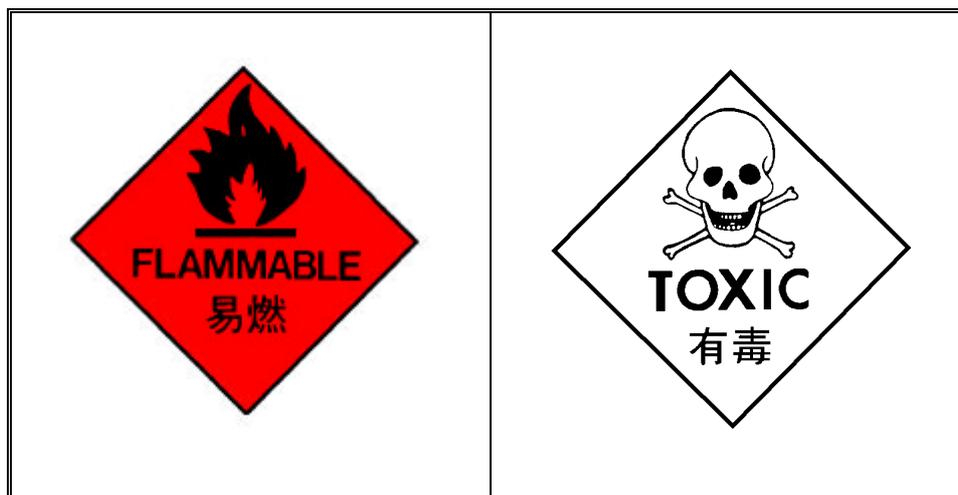
Chinese Name: 硫化氢

CAS NUMBER: 7783-06-4

SYNONYM(S):

Ad8; s-173; dihydrogen sulfide; sulfur hydride; hydrosulfuric acid; process stream

RISK SYMBOL



PHYSICAL DATA

BOILING POINT: -60 °C (-76 °F)

SP. GRAVITY (Water=1): 1.539 G/L

MELTING POINT: -85 °C (-121 °F)

% VOLATILE: NA

VAPOR PRESSURE: 14000 mm Hg @ 20 °C (68 °F)

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EVAPORATION RATE: NA
VAPOR DENSITY (Air=1): 1.19
VISCOSITY: NA
% SOLUBILITY IN WATER: SLIGHT
POUR POINT: NA
pH: 4.5 (WATER SOLUTION)
BULK DENSITY: ND
MOLECULAR WEIGHT: 34.08
MOLECULAR FORMULA: H₂S
ODOR/APPEARANCE:
Colorless Gas With Characteristic Odor of Rotten Eggs. Odor
Threshold: 0.13 ppm.

FIRE AND EXPLOSION DATA

FLASH POINT: -12 °C (10.4 °F)
AUTOIGNITION TEMPERATURE: 260 °C (500 °F)
FLAMMABILITY LIMITS IN AIR (% BY VOL.) LOWER: > 4.3
FLAMMABILITY LIMITS IN AIR (% BY VOL.) UPPER: < 45

HAZARDOUS COMBUSTION PRODUCTS: Combustion or thermal decomposition may produce oxides of sulfur.

BASIC FIRE FIGHTING PROCEDURES:

Shut off source of flow if possible. Do not extinguish fire if gas source cannot be shut off. Use a water spray to cool fire-exposed containers, structures and to protect personnel. If leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop a leak. Exposed firefighters must wear MSHA/NIOSH approved positive pressure self-contained breathing apparatus with full face mask and special protective clothing. NFPA recommends special protective clothing for hydrogen sulfide.

UNUSUAL FIRE & EXPLOSION HAZARDS:

Dangerous when exposed to heat or flame. Containers may explode in heat of fire. Materials can ignite under normal atmospheric conditions in the absence of any ignition source. Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back. Vapors or gas may accumulate in low areas. Vapors may concentrate in confined areas. Irritating and/or toxic substances may be emitted upon thermal decomposition.

REACTIVITY DATA

STABILITY/INCOMPATIBILITY: Stable. Avoid contact with strong oxidizers, metals and halogens.

HAZARDOUS REACTIONS/DECOMPOSITION PRODUCTS:

Irritating or toxic substances may be emitted upon thermal decomposition. Decomposition products include oxides of sulfur.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW:

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Colorless Gas With Characteristic Odor of Rotten Eggs. Odor Threshold: 0.13 ppm.

Danger! Flammable Gas. May Cause Flash Fire. Poisonous Gas. Harmful or Fatal If Inhaled or Absorbed Through the Skin. May Cause Skin, Eye and Respiratory Tract Irritation. Liquefied Material May Cause Frostbite and Freeze Burns. Heated Streams May Cause Thermal Burns.

POTENTIAL HEALTH EFFECTS:

SKIN:

May cause skin irritation. Hydrogen sulfide can penetrate the skin when exposed to high concentrations over long periods of time. Contact with liquefied material may cause frostbite. Contact with heated material may cause thermal burns.

EYE:

Exposure may cause moderate to severe irritation. May cause conjunctivitis, pain, keratitis, lacrimation, palpebral edema, photophobia, diplopia, blurred vision and the appearance of "haloes" around lights. Direct contact with liquefied material may cause permanent damage. Contact with heated material may cause thermal burns.

INHALATION:

Extremely Toxic. May cause respiratory tract irritation, pulmonary edema, cyanosis and harmful central nervous system effects. Effects may include excitation, euphoria, headache, dizziness, drowsiness, blurred vision, fatigue, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death. May also cause sore throat, chronic cough, bronchitis, nausea, diarrhea, loss of appetite, weight loss, irritability, insomnia and hypotension. Other effects may include blood changes and liver and kidney damage.

INGESTION: NA

SPECIAL TOXIC EFFECTS:

Hydrogen sulfide causes rapid death due to metabolic asphyxiation. Case reports suggest that toxic amounts of hydrogen sulfide can enter the body through a punctured eardrum, even while wearing some types of respiratory protective equipment. Consumption of alcoholic beverages may enhance toxic effects. WARNING--"rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure

Since odor fatigue readily occurs. Odor sensation lost immediately at concentrations greater than 200 ppm. IARC has determined that occupational exposures in petroleum refining are probably carcinogenic to humans.

See Section FIRST AID MEASURES - for Medical Conditions Aggravated By Exposure.

FIRST AID MEASURES

SKIN:

H₂S is poorly absorbed through the skin. Contact with liquefied material may cause frostbite. Keep affected area warm. If possible, submerge affected area in lukewarm water. Get immediate medical attention. Thermal burns require immediate medical attention.

EYE:

Contact with liquefied gas may cause frostbite. Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get immediate medical attention. Thermal burns require immediate medical attention.

INHALATION:

Most fatalities due to H2S intoxication occur at the scene of exposure and immediate supportive care is imperative. Safely remove the victim from exposure. Insure adequate ventilation and immediately provide oxygen at maximum flow rate. Vapors from crushed amyl nitrite perles may be administered for 30 seconds of every minute until an intravenous line for sodium nitrite administration is established. However the use of these antidotes must not delay adequate ventilation and maximum oxygenation. Get immediate medical attention.

INGESTION: NA

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Persons with pre-existing respiratory or eye conditions may be at an increased risk from exposure.

NOTES TO PHYSICIAN:

Hydrogen sulfide is primarily a respiratory toxin inhibiting the cytochrome-oxidase system; it is probably more potent than HCN. The lifetime of sulfide in oxygenated blood is short, and sulfmethemoglobin is rapidly detoxified by red blood cells and the liver. If nitrites have been used for detoxification, check methemoglobin levels. Follow fluid and electrolyte balance carefully since metabolic acidosis may occur from increased anaerobic metabolism. Watch for pulmonary edema and aspiration pneumonia during convalescence. Abrupt collapse may produce traumatic injuries. Amyl nitrite by inhalation and sodium nitrite (found in cyanide antidote kit) may be beneficial in preventing severe anoxia by converting hemoglobin to methemoglobin and protecting the cytochrome oxidase enzyme. Use cyanide therapy schedule but leave out sodium thiosulfate. Hyperbaric oxygen may be given to those who continue to be symptomatic after standard therapy. Observe for delayed onset (up to 72 hours) of acute respiratory effects.

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PREVENTATIVE MEASURES

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ENGINEERING CONTROLS:

Ventilation and other forms of engineering controls are often the preferred means for controlling chemical exposures.

PERSONAL PROTECTION EQUIPMENT (PPE):

EYE PROTECTION:

Prevent eye contact with this material. Wear chemical tight goggles. Provide an eyewash station immediately accessible to the work area. Do not wear contact lenses when working with this substance.

SKIN PROTECTION:

Prevent skin contact. Wear gloves found to be impervious under conditions of use. Additional protection may be necessary to prevent skin contact including use of apron, armcovers, face shield, boots, or full body protection. A safety deluge shower should be located in the work area.

RESPIRATORY PROTECTION:

If exposure limits are exceeded or if irritation is experienced, a NIOSH approved positive pressure, air-supplied respirator should be worn. Respiratory protection may be needed for non-routine or emergency situations. For air concentrations below 100 ppm, a powered air-purifying respirator or industrial gas mask may be used. .

HANDLING:

Keep containers closed. Hydrogen sulfide may be found in confined vapor spaces. Keep face clear of tank and tank car openings. Do not enter vapor spaces without proper respiratory equipment. Do not eat, drink or smoke in areas of use or storage. Use non-sparking tools. Ground lines and equipment used during transfer to reduce the possibility of static spark-initiated fire or explosion. Use good personal hygiene practices. Wash hands before eating, drinking, smoking, or using toilet facilities. Remove contaminated clothing and clean before reuse. Wash thoroughly after work using soap and water. Empty containers may contain toxic, flammable/combustible or explosive residue or

vapors. Do not cut, grind, drill, weld, reuse or dispose containers unless adequate precautions are taken against these hazards.

STORAGE:

Do not store in unlabeled containers. Store in tightly closed containers in cool, dry, isolated, well-ventilated area away from heat, sources of ignition and incompatibles.

ENVIRONMENTAL PROTECTION DATA

If your facility or operation has an "Oil or Hazardous Substance Contingency Plan", activate its procedures. Take immediate steps to stop and contain the spill. Caution should be exercised regarding personnel safety and exposure to the spilled material. For technical advice and assistance related to chemicals, contact CHEMTREC (800/424-9300) and your local fire department. Notify the National Response Center, if required. Also notify appropriate state and local regulatory agencies, the LEPC and the SERC. Contact the local Coast Guard if the release is into a waterway. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, keep out of low areas, and ventilate closed spaces before entering. (Also see Personal Protection Information section). Evacuate area endangered by gas. Isolate the leak or spill area immediately for at least 150 feet in all directions. Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. Do not touch or walk through spilled material; stop leak if you can do it without risk. Shut off ignition sources; no flares, smoking or flames in hazard area. Use water spray to reduce vapor; do not put water directly on leak or spill area. Isolate area until gas has dispersed. During an accidental release, personal protection equipment may be required (see Section EXPOSURE CONTROLS/PERSONAL PROTECTION). Additional regulatory requirements may apply (see Section REGULATORY INFORMATION).

Material Safety Data Sheet

City University of Hong Kong

MSDS**INDIGO CARMINE****0442**

PRODUCT INFORMATION

Chemical name(s) : INDIGO CARMINE

Chinese Name: 靛藍胭脂

Synonyms: Indigo carmine, indicator grade; Acid blue W; CI 73015

CAS No: 860-22-0

Molecular Weight: 466.36

Chemical Formula: $C_{16}H_{10}N_2O_8S_2 \cdot 2Na$

RISK SYMBOL

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PHYSICAL DATA

Appearance: Dark purple powder.

Boiling Point: No information found.

Odor: Light odor.

Melting Point: $> 300^{\circ}C$ ($> 572^{\circ}F$)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: 1 gm/100 ml water.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Light sensitive.
Hazardous Decomposition Products:
Burning may produce carbon monoxide, carbon dioxide, sulfur oxides, and nitrogen oxides.
Hazardous Polymerization: Will not occur.
Incompatibilities: Strong oxidizing agents.
Conditions to Avoid: Light and incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Caution! May be harmful if swallowed.
Potential Health Effects
Inhalation: No adverse health effects expected from inhalation.
Ingestion:
Low level of toxicity by ingestion. May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.
Skin Contact: No adverse effects expected.
Eye Contact: No adverse effects expected.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation:

Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

If swallowed, give several glasses of water to drink to dilute. If large amounts were swallowed or symptoms occur, get medical advice. Never give anything by mouth to an unconscious person.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System: Not expected to require any special ventilation.

Personal Respirators (NIOSH Approved): Not expected to require personal respirator usage.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Protect from light. Protect from freezing. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**1-IODOBUTANE****0443**

PRODUCT INFORMATION

Chemical name(s) : 1-IODOBUTANE
Chinese Name: 1-碘丁烷
Synonyms: Butane, 1-iodo-; n-butyliodide
CAS No: 542-69-8
Molecular Weight: 184.02
Chemical Formula: C₄H₉I

RISK SYMBOL



PHYSICAL DATA

Appearance: Light yellow liquid.
Boiling Point: 130.4°C (266°F)
Odor: No information found.
Melting Point: -103.0°C (-153°F)

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Solubility: Practically insoluble in water.
Vapor Density (Air=1): 5
Specific Gravity: 1.616 @ 20°C/4°C
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire:

Flash point: 33°C (91°F) CC
Flammable Liquid and Vapor! Contact with strong oxidizers may cause fire.

Explosion:

Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back. Sealed containers may rupture when heated.

Fire Extinguishing Media:

Dry chemical, foam, carbon dioxide, or water spray. Water may be ineffective. Water spray may be used to keep fire exposed containers cool. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Oxides of carbon as well as ionic or oxidized halogen. Burning may produce toxic iodine vapors.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers, strong bases; may discolor on exposure to light.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Flammable liquid and vapor. Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract.

Potential Health Effects

Inhalation:

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Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.

Ingestion:

No information found, but compound should be handled as a potential health hazard. May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect from light. Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

Material Safety Data Sheet

City University of Hong Kong

MSDS**FERRIC SULFATE****0444**

PRODUCT INFORMATION

Chemical name(s) : FERRIC SULFATE

Chinese Name: 硫(VI)酸鐵(III)

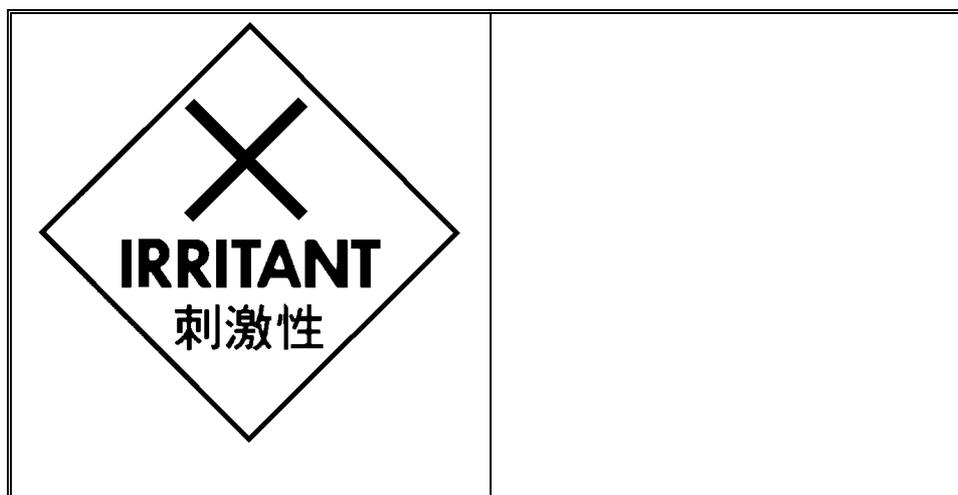
Synonyms: Iron (III) sulfate; iron persulfate; sulfuric acid, iron (3+) salt (3:2) hydrate

CAS No: 10028-22-5

Molecular Weight: 399.87

Chemical Formula: $\text{Fe}_2(\text{SO}_4)_3 \cdot x\text{H}_2\text{O}$

RISK SYMBOL



PHYSICAL DATA

Appearance: Grayish-white powder or rhombic crystals.

Boiling Point: Not applicable.

Odor: Odorless.

Melting Point: 480°C (896°F)

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Solubility: Soluble in water.
Vapor Density (Air=1): No information found.
Density: 3.097 (Anhydrous)
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Dry chemical, foam, carbon dioxide, or water spray.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Very hygroscopic.
Hazardous Decomposition Products: Oxides of sulfur and the contained metal.
Hazardous Polymerization: This substance does not polymerize.
Incompatibilities: No incompatibility data found.
Conditions to Avoid: Heat, light, moisture.

HEALTH HAZARD DATA

Emergency Overview

Warning! Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. Affects the liver.

Potential Health Effects

Inhalation:

Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.

Ingestion:

Low toxicity in small quantities but larger dosages may cause nausea, vomiting, diarrhea, and black stool. Pink urine discoloration is a strong indicator of iron poisoning. Liver damage, coma, and death from iron poisoning has been recorded.

Skin Contact:

Causes irritation to skin. Symptoms include redness, itching, and pain. May cause skin discoloration with irritation.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure:

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Prolonged exposure of the eyes may cause discoloration. Repeated high exposure could cause too much iron to build up in the body. Symptoms of upset stomach, nausea, constipation and black bowel movements may occur. Chronic exposure may cause liver effects.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-ACGIH Threshold Limit Value (TLV): 1 mg/m³ (TWA) soluble iron salt as Fe

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Maintain eye wash fountain and quick-drench facilities in work area. Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible.

Handling and Storage:

Keep in a tightly closed light-resistant container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. For ferric chloride anhydrous: US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Isopropyl Acetate****0445**

PRODUCT INFORMATION

Chemical Name: Isopropyl Acetate

Chinese Name: 異丙基醋酸酯

Synonyms:

Acetic acid, 1-methylethyl ester; acetic acid, isopropyl ester; sec-propyl acetate; 2-acetoxypropane; 2-propyl acetate

CAS Number: 108-21-4

RISK SYMBOL



PHYSICAL DATA

Boiling Point: 194.00°F (90°C)

Melting Point: -100.00°F (-73°C)

Vapor Pressure: 43.00 mm Hg @ 20°C

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Vapor Density (Air=1):3.50
% Solubility in Water:2.90
Pour Point: Not Determined
Molecular Formula: H10-C5-O2
Molecular Weight: 102.13
pH: Not Determined
Octanol/Water Partition Coefficient:Not determined
Viscosity: 0.4900 cP @ 25°C
Evaporation Rate (Water=1):Not Determined
% Volatile: Not Determined
Specific Gravity: 0.8700
Odor/Appearance: Clear, colorless liquid with fruity odor.

FIRE AND EXPLOSION DATA

Flashpoint: 35.00°F (2° C) CC
Autoignition Temperature:860.00°F (460°C)
Lower Flammability Limit: > 1.80
Upper Flammability Limit: < 8.00

Basic Firefighting Procedures:

Use dry chemical, foam or carbon dioxide to extinguish fire. Water may be ineffective but should be used to cool fire-exposed containers, structures and to protect personnel. If leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop leak. Use water to flush spills away from sources of ignition. Do not flush down public sewers or other drainage systems. Exposed firefighters must wear MSHA/NIOSH approved positive pressure self-contained breathing apparatus with full face mask and full protective clothing.

Unusual Fire and Explosion Hazards:

Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back. Dangerous when exposed to heat or flame. Runoff to sewer may cause fire or explosion hazard. Containers may explode in heat of fire. Irritating or toxic substances may be emitted upon thermal decomposition. Vapors may concentrate in confined areas.

REACTIVITY DATA

Stability/Incompatibility:

Stable under conditions of normal use. Avoid contact with oxidizing agents, mineral acids, strong acids and strong bases.

Hazardous Reactions/Decomposition Products:

Combustion may produce CO and CO₂.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
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Emergency Overview:

Warning! Flammable liquid & vapor. May be harmful if swallowed or inhaled. May be irritating to the skin, eyes, and respiratory tract. Possible aspiration hazard. Overexposure may cause liver and adverse CNS effects.

Potential Health Effects:

Eye Contact:

Exposure to liquid, vapors, fumes or mists may cause irritation. May cause irritation, edema, conjunctivitis, burns and possible permanent damage.

Skin Contact:

Repeated or prolonged contact may result in defatting, redness, itching, inflammation, cracking and possible secondary infection. May be absorbed through the skin.

Inhalation:

May irritate the respiratory tract and mucous membranes. May cause harmful central nervous system effects. Effects may include excitation, euphoria, headache, dizziness, drowsiness, blurred vision, fatigue, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death.

Ingestion:

May cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea. Exposure may cause central nervous system symptoms similar to those listed under "Inhalation". May cause liver damage.

Special Toxic Effects:

Damages genetic material in non-mammalian test systems. Individuals with pre-existing chronic respiratory impairments may be at an increased risk of aggravating respiratory disease.

FIRST AID MEASURES

Eye:

Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get immediate medical attention.

Skin:

Wash area of contact thoroughly with soap and water. Remove contaminated clothing immediately. Get immediate medical attention.

Inhalation:

Remove affected person from source of exposure. If not breathing, ensure clear airway and institute cardiopulmonary resuscitation (CPR). If breathing is difficult, administer oxygen if available. Keep affected person warm and at rest. Get immediate medical attention.

Ingestion:

Do not induce vomiting because of danger of aspirating liquid into lungs. If spontaneous vomiting occurs, monitor for breathing difficulty. Get immediate medical attention.

Notes to Physician:

Severe exposures to high concentrations are likely to cause narcosis, i.e. Signs and symptoms of CNS depression. Ingested material should be removed by gastric lavage, with care to avoid aspiration of liquid into the lungs, which may induce severe chemical pneumonitis.

PREVENTATIVE MEASURES

Eye Protection:

Prevent eye contact with this material. Wear chemical tight goggles. Provide an eyewash station immediately accessible to the work area.

Skin Protection:

Prevent skin contact. Wear gloves found to be impervious under conditions of use. Additional protection may be necessary to prevent skin contact including use of apron, armcovers, face shield, boots, or full body protection. A safety deluge shower should be located in the work area.

Respiratory Protection:

If exposure limits are exceeded or if irritation is experienced, NIOSH approved respiratory protection should be worn. Normally, a NIOSH approved respirator for organic vapors is generally acceptable. For high concentrations and for oxygen-deficient atmospheres, use a NIOSH approved air-supplied respirator. Ventilation and other forms of engineering controls are often the preferred means for controlling chemical exposures. Respiratory protection may be needed for non-routine or emergency situations.

Handling & Storage:

Store in tightly closed containers in cool, dry, isolated, well-ventilated area away from heat, sources of ignition and incompatibles. Ground lines and equipment used during transfer to reduce the possibility of static spark-initiated fire or explosion. Do not eat, drink or smoke in areas of use or storage.

ENVIRONMENTAL PROTECTION DATA

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. (Also see Personal Protection Information section.) Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces. Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large Spills: Dike far ahead of liquid spill for later disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD SULFATE****0446**

PRODUCT INFORMATION

Chemical name(s) : LEAD SULFATE

Chinese Name: 硫(VI)酸鉛(II)

Synonyms: Lead (II) sulfate; sulfuric acid, lead(2+) salt (1:1); CI 77630; Fast White; Milk White

CAS No: 7446-14-2

Molecular Weight: 303.25

Chemical Formula: PbSO₄

RISK SYMBOL



PHYSICAL DATA

Appearance: White crystalline powder.

Boiling Point: No information found.

Odor: Odorless.

Melting Point: 1170°C (2138°F)

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Solubility: Negligible.
Vapor Density (Air=1): No information found.
Specific Gravity: 6.2
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Fire may produce toxic fumes of lead and sulfur oxides.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Toxic fumes of lead and sulfur oxides.
Hazardous Polymerization: Will not occur.
Incompatibilities: Potassium.
Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Poison! Danger! Corrosive. May be fatal if swallowed or inhaled. Causes burns to any area of contact. Neurotoxin. Affects the eyes, gum tissue, central nervous system, kidneys, blood and reproductive system. Possible cancer hazard. May cause cancer based on animal data. Risk of cancer depends on duration and level of exposure.

Potential Health Effects

Inhalation:

Corrosive. Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.

Ingestion:

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Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. **POISON!** The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:

Corrosive. Symptoms of redness, pain, and severe burn can occur. Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation, redness and pain.

Eye Contact:

Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.

Chronic Exposure:

Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted.

Aggravation of Pre-existing Conditions:

Persons with pre-existing kidney, nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, **DO NOT INDUCE VOMITING**. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: For lead, metal and inorganic dusts and fumes, as Pb:

-OSHA Permissible Exposure Limit (PEL): 0.05 mg/m³ (TWA)
For lead, elemental and inorganic compounds, as Pb:
-ACGIH Threshold Limit Value (TLV): 0.05 mg/m³ (TWA), A3 animal carcinogen
ACGIH Biological Exposure Indices (BEI): 30 ug/100ml, notation B (see actual Indices for more information).
For lead, inorganic:
-NIOSH Recommended Exposure Limit (REL): 0.1 mg/m³ (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face high efficiency dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:

Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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ENVIRONMENTAL PROTECTION DATA
=====

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

Material Safety Data Sheet

City University of Hong Kong

MSDS MAGNESIUM METAL, POWDER 0447**PRODUCT INFORMATION**

Chemical name(s) : MAGNESIUM METAL, POWDER

Chinese Name: 鎂

Synonyms: Magnesium powder

CAS No: 7439-95-4

Molecular Weight: 24.30

Chemical Formula: Mg

RISK SYMBOL**PHYSICAL DATA**

Appearance: Silver solid.

Boiling Point: 1100°C (2012°F)

Odor: Odorless.

Melting Point: 649°C (1200°F)

Solubility: Insoluble in water.

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The above information is believed to be accurate to the best of our knowledge.
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Vapor Density (Air=1): No information found.
Specific Gravity: 1.74 @ 20°C (68°F) (solid)
Vapor Pressure (mm Hg): 1.0 @ 621°C (1150°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Autoignition temperature: 473°C (883°F) When heated in air to a temperature near its melting point, magnesium may ignite and burn. Dangerous in the form of dust or flakes, and when exposed to flame or by violent chemical reaction with oxidizing agents. Magnesium may react with moisture or acids to evolve hydrogen gas, which is a highly dangerous fire or explosion hazard.

Autoignition temperature is for Magnesium turnings or ribbon.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Minimum explosible concentration 0.030 grams/liter. Water used on molten magnesium will produce hydrogen gas and may cause an explosion.

Fire Extinguishing Media:

Use metal extinguishing powders such as G-1(R) graphite powder, Met-L-X(R) powder, powdered talc, dry graphite, powdered sodium chloride, soda ash, or dry sand. Warning! Do not use foam, chlorinated products such as Halon(R), carbon dioxide, or water to extinguish magnesium fires, because dangerous reactions will occur. Use of water on molten magnesium will produce hydrogen gas and may cause an explosion.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Fire fighters should protect their eyes and skin from flying particles. In order to prevent eye injury, do not look directly at magnesium fires.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Slowly oxidizes in moist air.

Hazardous Decomposition Products: Toxic gases and vapors may be released if involved in a fire.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Magnesium reacts dangerously with many substances, including oxidizers, carbonates, cyanides, chlorinated hydrocarbons, sulfates, acids, and other metals. Please refer to the NFPA publication "Fire Protection Guide on Hazardous Materials" most recent edition for details. Reacts with acids to form hydrogen gas.

Conditions to Avoid: Moisture, heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
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Emergency Overview

Warning! Flammable solid. Dangerous when wet. Highly reactive. May ignite spontaneously on contact with water or damp materials may cause irritation to skin, eyes, and respiratory tract.

Potential Health Effects

Inhalation:

Inhalation of dusts or fumes may irritate the respiratory tract and may cause metal fume fever. Symptoms may include coughing, chest pain, fever, and leukocytosis.

Ingestion: Magnesium metal does not have well-characterized toxicity. May cause abdominal pain and diarrhea.

Skin Contact: Particles embedded in the skin may cause eruptions. Molten magnesium may cause serious skin burns.

Eye Contact:

High concentrations of dust may cause mechanical irritation. Watching a magnesium fire can cause eye injury.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: Existing wounds contaminated with magnesium are very slow to heal.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in tightly closed container. Store in a cool, dry, ventilated area. Protect against physical damage. Store finely divided powder, chips or shavings in detached fire-resistant building, protected from moisture and away from oxidizers, chlorine, bromine, iodine, acids, and all possible sources of ignition. Heavier sections may be stored in the open. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate the area of the spill or leak. Wear appropriate personal protective equipment as specified in Section 8. Collect the spilled material and transfer to a clean, dry metal covered container for recovery or disposal. Do not use water in the collection process. If the spilled magnesium has come into contact with water, proceed with caution. Hydrogen gas may be generated, which may cause a fire or explosion. Evacuate the area, put on fire fighting protective equipment and proceed as with a metal fire.

Material Safety Data Sheet

City University of Hong Kong

MSDS**MAGNESIUM OXIDE****0448****PRODUCT INFORMATION**

Chemical name(s) : MAGNESIUM OXIDE

Chinese Name: 氧化鎂

Synonyms: Calcinated magnesia; Magnesia; Calcined Magnesite

CAS No: 1309-48-4

Molecular Weight: 40.32

Chemical Formula: MgO

RISK SYMBOL

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PHYSICAL DATA

Appearance: Bulky white powder.

Boiling Point: 3600°C (6512°F)

Odor: Odorless.

Melting Point: 2800°C (5072°F)

Solubility: Insoluble in water.

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Vapor Density (Air=1): No information found.
Specific Gravity: 3.58 @ 25°C (77°F)
Vapor Pressure (mm Hg): No information found.
pH: 10.3
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.

Explosion:

Magnesium oxide reacts violently or ignites with interhalogens such as chlorine trifluoride (ClF₃) or bromine pentafluoride (BrF₅), and incandescently with phosphorus pentachloride (PCl₅).

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Absorbs carbon dioxide and water from air.

Hazardous Decomposition Products: None known.

Hazardous Polymerization: Will not occur.

Incompatibilities: Acids, interhalogens, phosphorus pentachloride, and chlorine trifluoride.

Conditions to Avoid: Air, moisture, and incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Caution! May cause irritation to eyes and respiratory tract.

Potential Health Effects

Inhalation:

Nuisance dust. May cause irritation to the nasal passages, respiratory tract. Inhalation can cause a flu-like illness (metal fume fever). This 24- to 48-hour illness is characterized by chills, fever, aching muscles, dryness in the mouth and throat and headache.

Ingestion: Magnesium oxide is slowly absorbed. Ingestion may cause rapid bowel evacuation.

Skin Contact: No adverse effects expected.

Eye Contact: May cause irritation.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion: Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.
Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

For Magnesium Oxide Fume:

- OSHA Permissible Exposure Limit (PEL): 15 mg/m³ (TWA).
- ACGIH Threshold Limit Value (TLV): 10 mg/m³ (TWA).

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHANE****0449**

PRODUCT INFORMATION

PRODUCT NAME(S) : METHANE

Chinese Name: 甲烷

CAS NUMBER: 74-82-8

SYNONYM(S): METHYL HYDRIDE; MARSH GAS; FIRE DAMP; PROCESS STREAM; AB2/AB1-44

CHEMICAL FAMILY: HYDROCARBON, ALIPHATIC

MOLECULAR FORMULA: CH₄

MOLECULAR WEIGHT: 16.04

RISK SYMBOL



PHYSICAL DATA

BOILING POINT: -161.4 °C (-258.5 °F)

SPECIFIC GRAVITY: 0.717 G/L @ 0 °C (32 °F)

MELTING POINT: -182.6 °C (-296.7 °F)

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% VOLATILE: 100
VAPOR PRESSURE: 760 mm Hg -161 °C (-257.8 °F)
EVAPORATION RATE (WATER=1): NA
VAPOR DENSITY (AIR=1): 0.555
VISCOSITY: 0.011 CP @ 27 °C (80.6 °F)
% SOLUBILITY IN WATER: 3.5 @ 17 °C (62.6 °F)
OCTANOL/WATER PARTITION COEFFICIENT: LOG KOW = 1.09
POUR POINT: NA
pH: NA
APPEARANCE/ODOR: COLORLESS, ODORLESS, TASTELESS GAS.

FIRE AND EXPLOSION DATA

FLASH POINT: NA
AUTOIGNITION TEMPERATURE: 537.000 °C (999 °F)
FLAMMABILITY LIMITS IN AIR (% BY VOL.) LOWER: 5.000
FLAMMABILITY LIMITS IN AIR (% BY VOL.) UPPER: 15.000
BASIC FIREFIGHTING PROCEDURES:
Shut off source of flow if possible. Do not extinguish fire if gas source cannot be shut off. Use a water spray to cool fire-exposed containers, structures and to protect personnel. If leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop a leak.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Dangerous when exposed to heat or flame. Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back. Vapors or gas may accumulate in low areas. Vapors may concentrate in confined areas. Containers may explode in heat of fire. Materials can ignite under normal atmospheric conditions in the absence of any ignition source. Irritating or toxic substances may be emitted upon thermal decomposition.

REACTIVITY DATA

STABILITY/INCOMPATIBILITY:
Stable under conditions of normal use. Avoid contact with strong oxidizing agents and fluorine. Avoid overheating during transfer and storage. Incompatible with halogens, interhalogens and oxygen.

HAZARDOUS REACTIONS/DECOMPOSITION PRODUCTS:
Combustion may produce CO, CO₂ and reactive hydrocarbons.

HEALTH HAZARD DATA

INGESTION: NA
SKIN: Contact with liquefied material may cause frostbite.
EYE: Contact with liquefied material may cause frostbite.

INHALATION:

May cause harmful central nervous system effects. Effects may include excitation, euphoria, headache, dizziness, drowsiness, blurred vision, fatigue, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death. The lower alkanes are asphyxiant gases, which deplete available oxygen in potential breathing zones. May also cause anemia and irregular heart rhythm.

SPECIAL TOXIC EFFECTS: ND

FIRST AID MEASURES

INGESTION: NA

SKIN CONTACT:

Contact with liquefied gas may cause frostbite. Keep affected area warm. If possible, submerge affected area in lukewarm water. **GET IMMEDIATE MEDICAL ATTENTION.**

EYE CONTACT:

Contact with liquefied gas may cause frostbite. Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. **GET IMMEDIATE MEDICAL ATTENTION.**

INHALATION:

Remove affected person from source of exposure. If not breathing, ensure clear airway and institute cardiopulmonary resuscitation (CPR). If breathing is difficult, administer oxygen if available. **GET IMMEDIATE MEDICAL ATTENTION.**

PREVENTATIVE MEASURES

EYE PROTECTION:

Avoid eye contact with this material. Wear safety glasses or chemical goggles. Provide an eyewash station in the work area. **SKIN PROTECTION:** Avoid skin contact. When working with this substance, wear appropriate chemical protective gloves. Depending upon conditions of use, additional protection may be necessary such as face shield, apron, armcovers, etc.

RESPIRATORY PROTECTION:

If exposure limits are exceeded or if irritation is experienced, NIOSH approved respiratory protection should be worn. Ventilation and other forms of engineering controls are often the preferred means for controlling chemical exposures. Respiratory protection may be needed for non-routine or emergency situations.

ENVIRONMENTAL PROTECTION DATA

Emergency Action:

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, keep out of low areas, and ventilate closed spaces before entering. (Also see Personal Protection Information section.) Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.

Spill or Leak Procedure:

Shut off ignition sources; no flares, smoking or flames in hazard area. Do not touch or walk through spilled material; stop leak if you can do it without risk. Use water spray to reduce vapors; isolate area until gas has dispersed.

Notification:

No special procedures are required for clean-up of spills or leaks of this material. Avoid methods that result in water pollution. Caution should be exercised regarding personnel safety and exposure to the spilled material, as set forth elsewhere in this data sheet.

WASTE DISPOSAL:

This substance, when discarded or disposed of, is not specifically listed as a hazardous waste in Federal regulations; however it could be characteristically hazardous if it is considered toxic, corrosive, ignitable, or reactive according to Federal definitions (40 CFR 261). Additionally, it could be designated as hazardous according to state regulations. This substance could also become a hazardous waste if it is mixed with or comes in contact with a hazardous waste. Check 40 CFR 261 to determine whether it is a hazardous waste. If it is a hazardous waste, regulations at 40 CFR 262, 263, 264, 268 and 270 apply. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. The transportation, storage, treatment, and disposal of this waste material must be conducted in compliance with all applicable Federal, state, and local regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHYLAMINE****0450**

PRODUCT INFORMATION

Chemical name(s) : METHYLAMINE (40% in water)

Chinese Name: 甲<基>胺

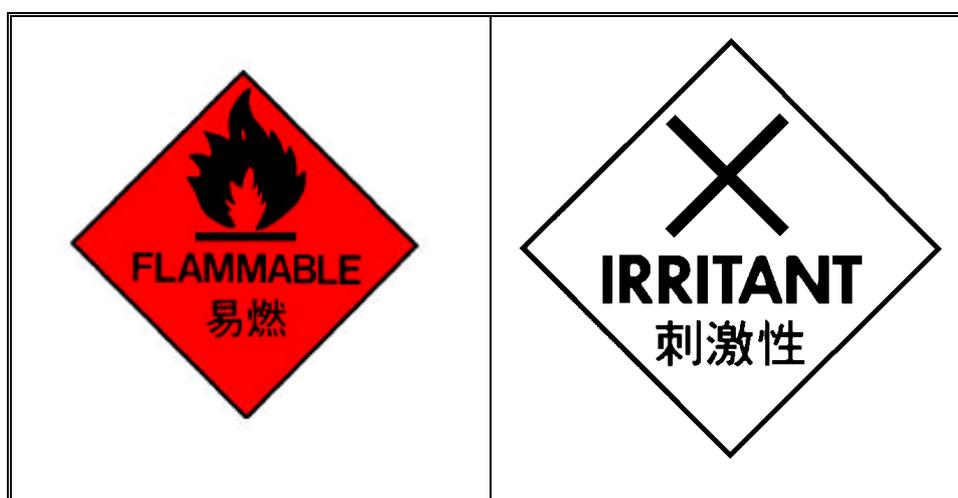
Synonyms: Methanamine; monoethylamine; aminoethane; methylamine aqueous solution.

CAS No: 74-89-5

Molecular Weight: 31.06

Chemical Formula: CH₃NH₂ in water

RISK SYMBOL



PHYSICAL DATA

Appearance: Clear, colorless liquid.

Boiling Point: 18 - 29°C (64 - 84°F)

Odor: Characteristic ammoniacal odor.

Melting Point: -38°C (-36°F)

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Solubility: Infinitely soluble.
Vapor Density (Air=1): 1.08
Specific Gravity: 0.902
Vapor Pressure (mm Hg): 300 @ 25°C (77°F)
pH: Stronger base than ammonia.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire:

Flash point: 0°C (32°F) CC
Autoignition temperature: 430°C (806°F)
Flammable limits in air % by volume:
LEL: 4.9; UEL: 20.7
Listed fire data is for 100% Methylamine.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Use water spray to cool fire-exposed containers, to dilute liquid, and control vapor.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Stable under ordinary conditions of use and storage. The solution gives off methylamine which forms explosive mixtures in air. A strong base.

Hazardous Decomposition Products: Burning may produce carbon monoxide, carbon dioxide, nitrogen oxides.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Reacts violently with acids and is corrosive toward aluminum, zinc and other metals. Reacts with mercury to form compounds that are shock sensitive. Incompatible with strong oxidizers, carbon dioxide.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
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Emergency Overview

Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Corrosive. Causes burns to any area of contact. Harmful if swallowed, inhaled or absorbed through skin. Causes irritation to eyes and respiratory tract.

Potential Health Effects

Inhalation:

Corrosive. Extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. Inhalation may be fatal as a result of spasm inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.

Ingestion:

Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach. Can cause sore throat, vomiting, diarrhea.

Skin Contact: Corrosive. Symptoms of redness, pain, and severe burn can occur.

Eye Contact:

Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure: Prolonged or repeated exposure may cause long-term respiratory effects.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.

Ingestion:

Do not induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.

Eye Contact:

Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

Note to Physician:

Onset of pulmonary edema may be delayed. Monitoring for at least 72 hours is recommended.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 10 ppm (TWA)
- ACGIH Threshold Limit Value (TLV): 5 ppm (TWA), 15 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with an ammonia/methylamine cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ISOBUTYL ALCOHOL****0451****PRODUCT INFORMATION**

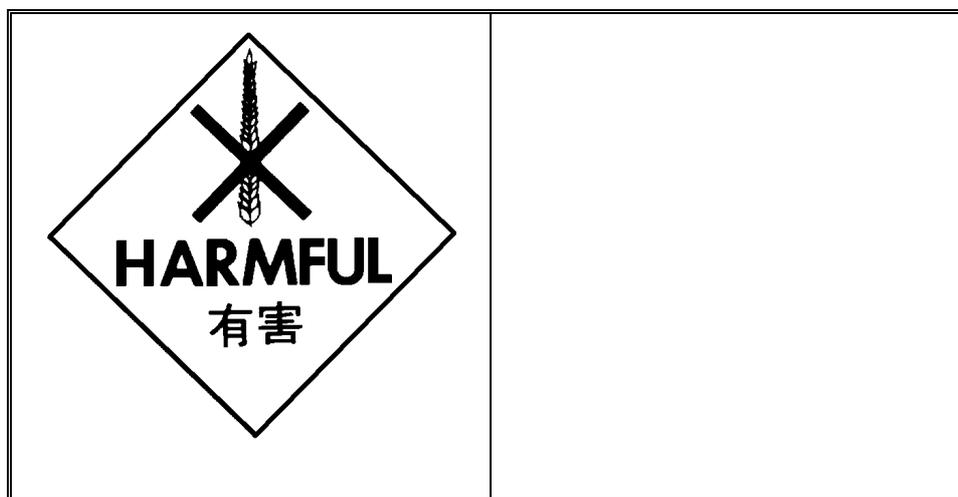
Chemical name(s) : ISOBUTYL ALCOHOL

Chinese Name: 異丁醇

Synonyms: 1-Hydroxymethylpropane; isobutanol; 2-methylpropanol; 2-methyl-1-propanol; Isopropylcarbinol

CAS No: 78-83-1

Molecular Weight: 74.12

Chemical Formula: $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$ **RISK SYMBOL****PHYSICAL DATA**

Appearance: Clear, colorless solution.

Boiling Point: 108°C (226°F)

Odor: Sweet-musty odor.

Melting Point: -108°C (-162°F)

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Solubility: 9.5g/100ml water @ 20°C (68°F).
Vapor Density (Air=1): 2.6
Specific Gravity: 0.803
Vapor Pressure (mm Hg): 8.8 @ 20°C (68°F)
pH: No information found.
Evaporation Rate (BuAc=1): 0.8
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: 28°C (82°F) CC
Autoignition temperature: 415°C (779°F)
Flammable limits in air % by volume:
LEL: 1.7; UEL: 10.6
Flammable Liquid and Vapor!

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Containers may explode in heat or fire.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Do not use a solid stream of water, since the stream will scatter and spread the fire. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Burning may produce carbon monoxide, carbon dioxide and isobutylene.

Hazardous Polymerization: Will not occur.

Incompatibilities: Oxidizing agents, inorganic acids, aldehydes, isocyanates.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Flammable liquid and vapor. Harmful if swallowed, inhaled or absorbed through skin. Affects central nervous system. Causes irritation to skin, eyes and respiratory tract. Potential health effects

Inhalation:

Causes irritation to respiratory tract. Effects from overexposure include headache, dizziness, muscle weakness, drowsiness, incoordination, confusion, and coma. High concentrations can cause central nervous system damage, pulmonary edema, and liver damage. Death may occur from respiratory failure.

Ingestion:

Ingestion may cause nausea, vomiting, and diarrhea. Large doses may cause central nervous system damage, pulmonary edema, and liver damage. Death may occur from respiratory failure.

Skin Contact:

Skin contact causes irritation, redness, and pain. May be absorbed through the skin; symptoms of absorption may be similar to those from ingestion exposure.

Eye Contact:

Vapors cause irritation, redness, and blurred vision. Splashes may cause severe irritation or eye damage.

Chronic Exposure: Prolonged or repeated skin exposure may cause dermatitis.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Wash clothes before reuse. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL): 100 ppm (TWA)

-ACGIH Threshold Limit Value (TLV): 50 ppm (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

Material Safety Data Sheet

City University of Hong Kong

MSDS**2-NAPHTHOL****0452****PRODUCT INFORMATION**

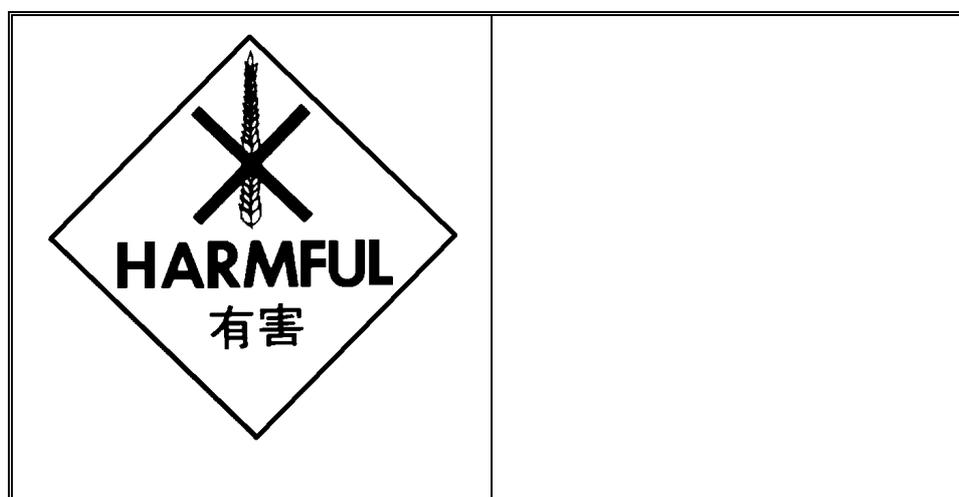
Chemical name(s) : 2-NAPHTHOL

Chinese Name: (2)- 酚

Synonyms: 2-Naphthalenol; (beta)-naphthol; (beta)-Hydroxynaphthalene; Isonaphthol

CAS No: 135-19-3

Molecular Weight: 144.17

Chemical Formula: C₁₀H₈O**RISK SYMBOL****PHYSICAL DATA**

Appearance: White to yellowish-white crystals.

Boiling Point: 285 - 286°C (545 - 547°F)

Odor: Slight phenolic odor.

Melting Point: 121 - 123°C (250 - 253°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Slightly soluble in water.
Vapor Density (Air=1): 4.97
Density: 1.22
Vapor Pressure (mm Hg): 10 @ 145.5°C (295°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Flash point: 153°C (307°F) CC
Not considered to be a fire hazard.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Stable under ordinary conditions of use and storage. Darkens with age or exposure to light. Sublimes when heated.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers, strong bases, phenol, acid chlorides and acid anhydrides.

Conditions to Avoid: Heat, flame, sources of ignition, light and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract.

Potential Health Effects: Information on the human health effects from exposure to this substance is limited.

Inhalation: Inhalation of dust is irritating to the upper respiratory tract.

Ingestion: Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**NINHYDRIN MONOHYDRATE****0453****PRODUCT INFORMATION**

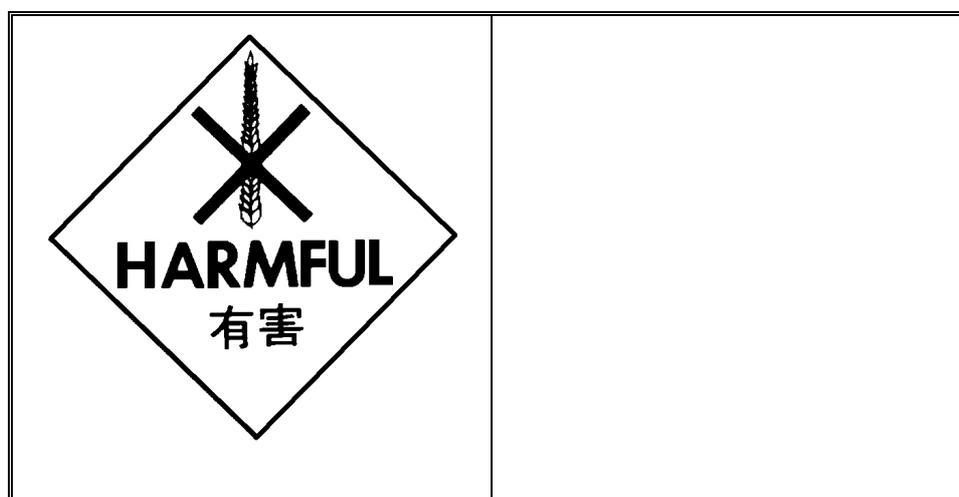
Chemical name(s) : NINHYDRIN MONOHYDRATE

Chinese Name: 寧希德林 , <水合> 三酮

Synonyms: 1,2,3-Indantrione monohydrate; triketohydrindene hydrate

CAS No: 485-47-2

Molecular Weight: 178

Chemical Formula: C₉H₄O₃.H₂O**RISK SYMBOL****PHYSICAL DATA**

Appearance: White to brownish-white crystals.

Boiling Point: Not applicable.

Odor: No information found.

Melting Point: 250°C (482°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Freely soluble.
Vapor Density (Air=1): 6.16
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Dry chemical, foam, carbon dioxide, or water spray.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Reddens when heated above 100°C(212°F)

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Causes irritation to eyes and skin. May be harmful if swallowed, inhaled or absorbed through skin.

Potential Health Effects: Information on the human health effects from exposure to this substance is limited.

Inhalation: Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.

Ingestion: Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact: Causes irritation. May be absorbed through skin. Discolors the skin.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 15 mg/m³ total dust, 5 mg/m³ respirable fraction for nuisance dusts.
- ACGIH Threshold Limit Value (TLV):
10 mg/m³ total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**1-OCTADECANOL****0454**

PRODUCT INFORMATION

Chemical name(s) : 1-OCTADECANOL

Chinese Name: 十八碳烯醇

Synonyms: Stearyl alcohol; decyl octyl alcohol

CAS No: 112-92-5

Molecular Weight: 270.50

Chemical Formula: C₁₈H₃₈O

RISK SYMBOL

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PHYSICAL DATA

Appearance: Colorless solid or flakes.

Boiling Point: 202°C (396°F)

Odor: Faint odor.

Melting Point: 58°C (136°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Insoluble in water.
Vapor Density (Air=1): No information found.
Specific Gravity: 0.812
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: No adverse health effects expected from inhalation.

Ingestion: Large doses may cause gastro-intestinal upset.

Skin Contact: No adverse effects expected.

Eye Contact: No adverse effects expected.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Not expected to require first aid measures.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Call a physician if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System: Not expected to require any special ventilation.

Personal Respirators (NIOSH Approved): Not expected to require personal respirator usage.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Safety glasses.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Protect from freezing. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**OCTANE****0455****PRODUCT INFORMATION**

Chemical name(s) : OCTANE
Chinese Name: 辛烷
Synonyms: Normal octane; n-octane
CAS No: 111-65-9
Molecular Weight: 114.23
Chemical Formula: $\text{CH}_3(\text{CH}_2)_6\text{CH}_3$

RISK SYMBOL**PHYSICAL DATA**

Appearance: Clear, colorless liquid.
Boiling Point: 126°C (259°F)
Odor: Gasoline-like odor.
Melting Point: -57°C (-71°F)

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Solubility: Essentially insoluble in water.
Vapor Density (Air=1): 3.9
Density: 0.7 20/4°C
Vapor Pressure (mm Hg): 14 @ 25°C (77°F)
pH: No information found.
Evaporation Rate (BuAc=1): 1.4
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: 13°C (55°F) CC
Autoignition temperature: 220°C (428°F)
Flammable limits in air % by volume:
LEL: 1.0; UEL: 6.5
Flammable Liquid and Vapor!

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Severe explosion hazard when exposed to heat or flame. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Heat will contribute to instability.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Heat, flame, oxidizers.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Danger! Flammable liquid and vapor. Harmful or fatal if swallowed. Harmful if inhaled. Causes irritation to skin, eyes and respiratory tract. Affects central nervous system.

Potential Health Effects

Inhalation:

Vapors have a mild narcotic effect and may irritate the mucous membranes. Severe exposures may cause drowsiness, unconsciousness and death.

Ingestion:

May produce abdominal pain, nausea. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms expected to parallel inhalation.

Skin Contact: May cause mild irritation, redness, pain.

Eye Contact: Vapors may irritate the eyes. Splashes may produce redness, pain.

Chronic Exposure: Prolonged or repeated skin contact may cause dermatitis.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or impaired pulmonary function may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Wash clothes before reuse. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL): 500 ppm (TWA),

-ACGIH Threshold Limit Value (TLV): 300 ppm (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Paraffin****0456**

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PRODUCT INFORMATION

Chemical name(s) : Paraffin

Chinese Name: 石蠟

Synonyms: None

CAS No: 8002-74-2

Molecular Weight: Not applicable.

Chemical Formula: Not applicable.

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RISK SYMBOL

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PHYSICAL DATA

Appearance: Wax-like prills.

Boiling Point: No information found.

Odor: Odorless.

Melting Point: 56°C (133°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Negligible (< 0.1%)
Vapor Density (Air=1): Not applicable.
Specific Gravity: 0.90
Vapor Pressure (mm Hg): Not applicable.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Flash point: 204°C (399°F) CC

Explosion: No information found.

Fire Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Information:

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizing agents.

Conditions to Avoid: Heat, flame, other sources of ignition.

HEALTH HAZARD DATA

Emergency Overview

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: None identified.

Ingestion: Irritation of mucous membranes.

Skin Contact: Irritation.

Eye Contact: Irritation.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Inhalation: If a person breathes in large amounts, move the exposed person to fresh air.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact: In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

Eye Contact: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-ACGIH Threshold Limit Value (TLV): 2 mg/m³ (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator.

WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: None required.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep container tightly closed. Suitable for any general chemical storage area. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Wear suitable protective clothing. Carefully sweep up and remove.

Material Safety Data Sheet

City University of Hong Kong

MSDS**AMYL ALCOHOL****0457**

PRODUCT INFORMATION

Chemical name(s) : AMYL ALCOHOL

Chinese Name: 戊醇

Synonyms: n-amyl alcohol; 1-pentanol; pentyl alcohol; n-butyl carbinol

CAS No: 71-41-0

Molecular Weight: 88.15

Chemical Formula: C₅H₁₁OH

RISK SYMBOL



PHYSICAL DATA

Appearance: Clear, colorless liquid

Boiling Point: 134 - 138°C (273 - 280°F)

Odor: Characteristic odor.

Melting Point: -79°C (-110°F)

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Solubility: 2.7gm/100gm water @ 22°C (71.6°F).
Vapor Density (Air=1): 3.04
Specific Gravity: 0.81 @ 20°C/4°C
Vapor Pressure (mm Hg): 1 @ 13.6°C (57°F)
pH: No information found.
Evaporation Rate (BuAc=1): 0.18
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: 33°C (91°F) CC
Autoignition temperature: 300°C (572F)
Flammable limits in air % by volume:
LEL: 1.2; UEL: 10
Flammable. Upper explosive limit is for 100°C (212°F).

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool. Water may be ineffective.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable at room temperature in sealed containers.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition. Can form aldehydes burning in limited air.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers. Strong inorganic acids. Heat and sources of ignition.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Warning! Flammable liquid and vapor. Harmful if swallowed, inhaled or absorbed through skin. Vapors cause respiratory tract irritation and severe eye irritation. Liquid causes skin irritation, severe eye irritation and possible eye burns. Affects central nervous system.

Potential Health Effects

Inhalation:

Inhalation of vapors can irritate the nose, throat, and upper respiratory passages. Higher concentrations have a narcotic effect and may cause headache, nausea, vomiting, dizziness, double vision, shortness of breath, and delirium. In severe cases, inhalation may be fatal.

Ingestion:

Moderately toxic by ingestion, can cause headache, nausea, delirium and methemoglobin formation in the blood. Other symptoms may parallel those from inhalation exposure. Vomiting may cause aspiration into lungs and result in chemical pneumonia.

Skin Contact:

Brief contact is not irritating. Prolonged contact may cause severe irritation with pain, redness, swelling, and possible tissue damage. Suspected to be a systemic poison by absorption through skin; systemic effects paralleling ingestion may occur.

Eye Contact:

Vapors cause severe irritation. Symptoms may include tearing, pain, redness, swelling. Liquid contact causes severe irritation and possible burns.

Chronic Exposure: Repeated inhalation of aerosols may result in lung and kidney injury.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired kidney or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

The following exposure limits for isoamyl alcohol (CAS 123-51-3) may be used as models.

-OSHA Permissible Exposure Limit (PEL): 100 ppm (TWA)

-ACGIH Threshold Limit Value (TLV): 100 ppm (TWA), 125 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator.

WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PEPSIN****0458**

PRODUCT INFORMATION

Chemical name(s) : PEPSIN

Chinese Name: 胃蛋白[®]

Synonyms: Pepsin A; Pepsin NF; Pepsinum; Puerzym

CAS No: 9001-75-6

Molecular Weight: 34500

Chemical Formula: Not applicable.

RISK SYMBOL

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PHYSICAL DATA

Appearance: White to light yellow powder.

Boiling Point: No information found.

Odor: Characteristic odor.

Melting Point: No information found.

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Soluble in water.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source. Being an animal protein, Pepsin is assumed to be combustible. Avoid inhalation of combustion fumes. Pepsin powder may, on being transferred from container to container, generate static electrical charge, which could discharge violently.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Somewhat hygroscopic.

Hazardous Decomposition Products: Burning may produce carbon monoxide, carbon dioxide, nitrogen oxides.

Hazardous Polymerization: Will not occur.

Incompatibilities: Tannin, alkalis, salts of heavy metals, strong oxidizers.

Conditions to Avoid: Moisture, heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

WARNING! MAY CAUSE IRRITATION TO SKIN AND EYES. MAY CAUSE ALLERGIC SKIN REACTION.

Potential Health Effects

Inhalation: No adverse health effects expected from inhalation.

Ingestion: Large doses may cause gastro-intestinal upset. May cause an allergic reaction.

Skin Contact: May cause irritation, allergic reaction. May result in reddening, burning sensation.

Eye Contact: May cause irritation.

Chronic Exposure: Possible hypersensitivity, dermatitis.

Aggravation of Pre-existing Conditions:

Individuals with dermatitis or hypersensitivity to material may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact:

Immediately flush skin with plenty of soap and water. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System: Not expected to require any special ventilation.

Personal Respirators (NIOSH Approved): Not expected to require personal respirator usage.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

City University of Hong Kong

MSDS PHLOROGLUCINOL DIHYDRATE 0459**PRODUCT INFORMATION**

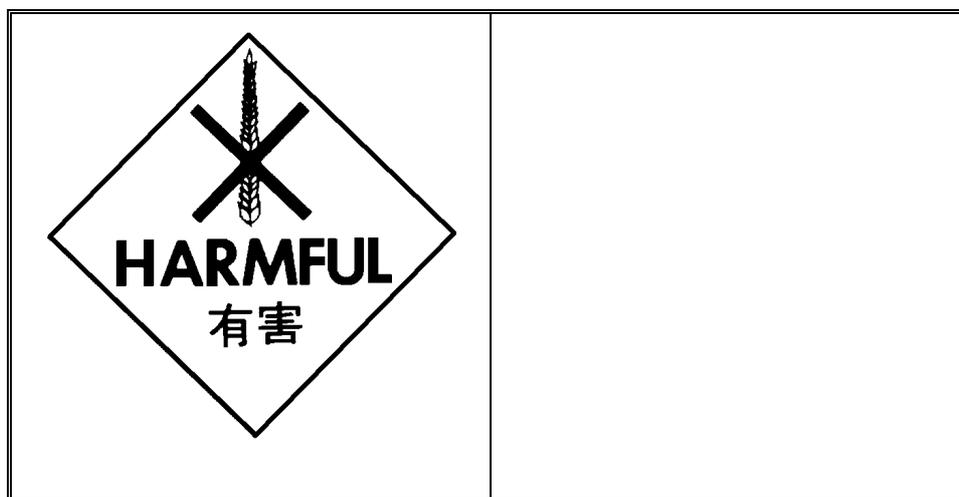
Chemical name(s) : PHLOROGLUCINOL DIHYDRATE

Chinese Name: 苯-1,3,5-三酚

Synonyms: 1,3,5-Benzenetriol; benzene-s-triol

CAS No: 108-73-6 (Anhydrous)

Molecular Weight: 162.14

Chemical Formula: $C_6H_6O_3 \cdot 2H_2O$ **RISK SYMBOL****PHYSICAL DATA**

Appearance: White to yellow crystals or powder.

Boiling Point: No information found.

Odor: Odorless.

Melting Point: 218 - 221°C (424 - 430°F)

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Solubility: Soluble in 100 parts water.
Vapor Density (Air=1): 4.3
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Stable under ordinary conditions of use and storage. Discolors in light.

Sublimes with decomposition.

Hazardous Decomposition Products: Burning may produce carbon monoxide, carbon dioxide, nitrogen oxides.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: Heat, flame, sources of ignition, light and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

Potential Health Effects

Information on the human health effects from exposure to this substance is limited.

Inhalation: Excessive inhalation of dust may be irritating to the respiratory tract.

Ingestion: No information found, but compound should be handled as a potential health hazard.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Refrigerate. Protect from light. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PHOSPHORUS AMORPHOUS****0460****PRODUCT INFORMATION**

Chemical name(s) : PHOSPHORUS AMORPHOUS
Chinese Name: 紅磷
Synonyms: Red Phosphorus; Phosphorus Amorphous Red
CAS No: 7723-14-0
Molecular Weight: 30.97
Chemical Formula: P

RISK SYMBOL**PHYSICAL DATA**

Appearance: Red to violet powder.
Boiling Point: No information found.
Odor: Odorless.
Melting Point: No information found.

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Solubility: Insoluble in water.
Vapor Density (Air=1): No information found.
Specific Gravity: 2.34 @ 20°C/4°C
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Autoignition temperature: 260°C (500°F)
Flammable solid. May ignite from friction or rough handling.

Explosion: May form explosive mixtures with oxidizing materials. Sensitive to static discharge.

Fire Extinguishing Media:

Water flooding followed by covering with wet sand, clay, ground limestone until clean-up.

Special Information:

Burning phosphorus produces irritating but not highly toxic oxides. Flame-retardant full protective clothing and full breathing apparatus should be worn with phosphorus fires. The red form can convert to the more readily-flammable yellow form at high temperatures.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

White phosphorous, oxides of phosphorous, phosphine, and phosphoric acid (if water is present) may be released if this material is heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Halogens, halides, sulfur, oxidizing materials and alkalis (forms phosphine).

Conditions to Avoid: Heat, flame, ignition sources, shock, friction, incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Flammable solid. May ignite from friction or rough handling. Causes eye irritation. May be harmful if swallowed or inhaled.

Potential Health Effects

Inhalation:

Not considered highly toxic but acute exposure may cause coughing, bronchitis, possible liver or kidney impairment if contaminated with yellow phosphorus.

Ingestion:

Red phosphorus is not readily absorbed and, in pure form, is considered non-poisonous. However, possible contamination with the yellow form must be considered, and symptoms such as nausea, vomiting, abdominal pain or garlic odor on breath will indicate poisoning by the latter. The estimated lethal adult human dose for white phosphorus is 50 - 100 mg.

Skin Contact:

Red phosphorus is not harmful to skin. If contaminated with white phosphorus, however, contact may cause deep, slow healing burns.

Eye Contact:

Red phosphorus causes eye irritation. If contaminated with yellow phosphorus, eye contact can cause severe irritation and burns.

Chronic Exposure:

Chronic ingestion or inhalation may induce systemic phosphorous poisoning. Liver damage, kidney damage, jaw/tooth abnormalities, blood disorders and cardiovascular effects can result.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, jaw/tooth abnormalities, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. Get medical attention.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source,

preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures: Presence of yellow phosphorous as an impurity will change necessary protective equipment.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Protect from light. Avoid dust formation and control ignition sources. Employ grounding, venting and explosion relief provisions in accord with accepted engineering practices in any process capable of generating dust and/or static electricity. Empty only into inert or non-flammable atmosphere. Emptying contents into a non-inert atmosphere where flammable vapors may be present could cause a flash fire or explosion due to electrostatic discharge. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Moisten the spilled phosphorus as a precaution and keep it under wet sand or the like until it can be collected and placed in a closed container for recovery or disposal. Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Phthalic anhydride****0461****PRODUCT INFORMATION**

Chemical name: Phthalic anhydride

Chinese Name: 酞酐

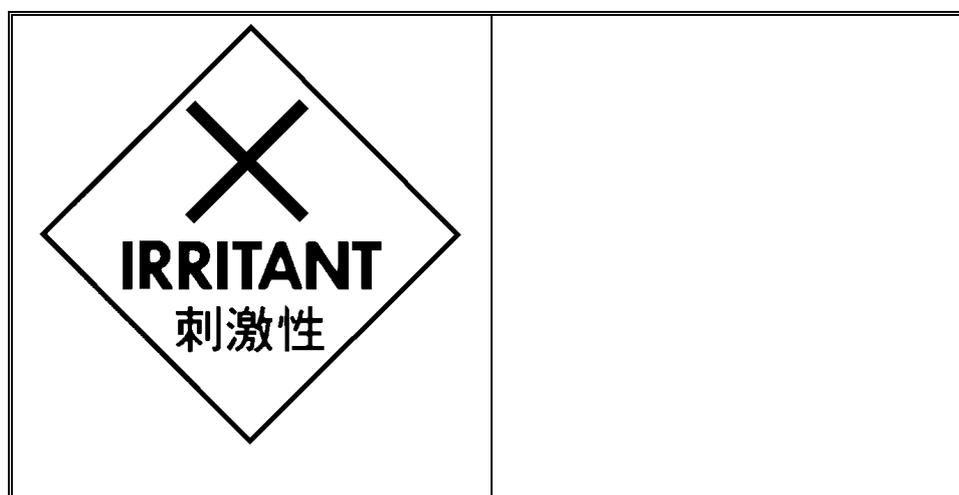
Synonyms: 1,2-Benzenedicarboxylic acid anhydride; 1,3-isobenzofurandione; 1,3-phthalandione; phthalic acid anhydride.

Chemical family: Acid anhydride

Formula: $C_6H_4(CO)_2O$

Molecular weight: 148

CAS number: 85-44-9

RISK SYMBOL**PHYSICAL DATA**

Boiling point (760 mm Hg): 285°C (545 °F)

Freezing point: 131 °C (268 °F)

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Specific gravity (H₂O = 1 @ 20/20°C): Flake- 1.53 Molten - 1.2

Vapor pressure (20°C): 0.0015 mm Hg (131°C): 6 mm Hg

Vapor density (Air = 1 @ 20°C): 5.1

Solubility in water (% by WT @ 20°C): 0.6

Percent volatiles by volume: 100

Appearance and odor:

Phthalic anhydride flake is a white solid. Molten phthalic anhydride is a clear, colorless mobile liquid. Both have a choking odor.

FIRE AND EXPLOSION DATA

Flammable limits in air, % by volume

Upper: 10.4

Lower: 1.7

Flash point (test method):

Tag open cup (ASTM D1310): 329°F (165°C)

Tag closed cup (ASTM D56): 305° F (152°C)

Extinguishing media:

Use CO₂ or dry chemical for small fires, alcohol-type aqueous film- forming foam or water spray for large fires.

Special fire-fighting procedures:

If potential for exposure to vapors or products of combustion exists, wear complete personal protective equipment and respirator approved by both NIOSH and MSHA and within the working limits of the respirator. Self-contained breathing apparatus with full facepiece operated in pressure demand or other positive pressure mode. Supplied-air respirator with full facepiece and operated in pressure- demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode. Use water spray to cool fire-exposed structures and vessels.

Unusual fire and explosion hazards:

During fire-fighting operations, avoid directing water into vessels containing anhydrides. Flake - can form an explosive organic dust cloud. Do not use compressed air to transfer this material. Foam or water can cause frothing.

REACTIVITY DATA

Stability: Stable

Hazardous polymerization: Will not occur.

Conditions to avoid: Heat, spark, flame.

Materials to avoid: Nitric acid, hydrogen peroxide and other strong oxidizing agents.

Hazardous combustion or decomposition products: Carbon monoxide.

HEALTH HAZARD DATA

Acute:

Ingestion (swallowing): Slightly toxic to animals (oral LD₅₀, rats: 4.0 g/kg).

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Inhalation (breathing):

Irritating to mouth, throat and nasal passages. No information regarding toxicity to animals by inhalation.

Skin contact:

Can cause severe injury (reddening and swelling). Causes sensitization (allergic reaction). No information regarding toxicity to animals by absorption.

Eye contact: Can cause severe injury - damage reversible.

Chronic:

Mutagenicity: In vitro, no information. In vivo, no information.

Carcinogenicity: No information.

Reproduction: No information.

Medical conditions aggravated by exposure:

Significant exposure to this chemical may adversely affect people with chronic disease of the respiratory system, skin, eyes, liver and/or kidneys.

FIRST AID MEASURES

Ingestion (swallowing):

Induce vomiting of conscious patient immediately by giving two glasses of water and pressing finger down throat. Contact a physician immediately.

Inhalation (breathing):

Remove patient from contaminated area. If breathing has stopped, give artificial respiration, then oxygen if needed. Contact a physician immediately.

Skin contact:

Remove contaminated clothing and wash contaminated skin with large amounts of water. If irritation persists, contact a physician.

Eye contact:

Flush eyes with water for at least 15 minutes. Contact a physician immediately.

PREVENTATIVE MEASURES

Respiratory protection:

Based on contamination level and working limits of the respirator, use a respirator approved by both NIOSH and MSHA.

5 ppm - Any dust and mist respirator except single-use respirators.

10 ppm - Any dust and mist respirator except single-use and quarter-mask respirators. Any supplied-air respirator. Any self-contained breathing apparatus.

25 ppm - Any supplied-air respirator operated in a continuous flow mode. Any powered air-purifying respirator with a dust and mist filter.

50 ppm - Any supplied-air respirator with a full facepiece. Any self-contained breathing apparatus with a full facepiece. Any air-purifying full facepiece respirator with a high-efficiency particulate filter.

2000 ppm - Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.

Escape - Any air-purifying full facepiece respirator with a high-efficiency particulate filter. Any appropriate escape-type self-contained breathing apparatus.

Ventilation

Local exhaust:

Recommended when appropriate to control employee exposure. Mechanical (general): Not recommended as the sole means of controlling employee exposure.

Protective gloves: Neoprene or rubber.

Eye protection: Chemical safety goggles.

Other protective equipment: For operations where spills can occur, use impervious body covering and boots.

Precautions to be taken in handling and storing:

Keep away from heat, sparks and flame. Keep containers closed. When transferring follow proper grounding procedures. Use with adequate ventilation. Avoid breathing vapor. Avoid contact with eyes, skin and clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use. Discard contaminated leather clothing. Do not enter storage area unless adequately ventilated. Avoid generation of excessive dust.

ENVIRONMENTAL PROTECTION DATA

Steps to be taken if material is released or spilled:

Eliminate ignition sources. Avoid eye or skin contact. Place leaking containers in well-ventilated area. Contain spill to minimize contaminated area and facilitate salvage or disposal. Avoid runoff into storm sewers and ditches which lead to natural waterways. All clean-up and disposal should be carried out in accordance with federal, provincial and local regulations. If required, provincial and local authorities should be notified.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Propanoic acid****0462**

PRODUCT INFORMATION

Chemical name: Propionic acid

Chinese Name: 丙酸

Synonyms: Propanoic acid; methylacetic acid; ethanecarboxylic acid.

Chemical family: Monocarboxylic acid

Formula: $\text{CH}_3\text{CH}_2\text{COOH}$

Molecular weight: 74

CAS number: 79-09-4

RISK SYMBOL



PHYSICAL DATA

Boiling point (760 mm Hg): 141 °C (286 °F)

Freezing point: -20.8 °C (-5 °F)

Specific gravity ($\text{H}_2\text{O} = 1$ @ 20/20 °C): 0.9954

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Vapor pressure (20 °C): 2.9 mm Hg
Vapor density (Air = 1 @ 20 °C): 4.5
Solubility in water (% by WT @ 20 °C): Complete
Percent volatiles by volume: 100
Evaporation rate (BuAc=1): 0.24
Appearance and odor: Clear, colorless mobile liquid with a strong, acrid odor.

FIRE AND EXPLOSION DATA

Flammable limits in air, % by volume

Upper: 14.8

Lower: 2.9

Flash point (test method):

Tag open cup (ASTM D1310): 134 °F (57 °C)

Tag closed cup (ASTM D56): 127 °F (53 °C)

Extinguishing media:

Use CO₂ or dry chemical for small fires, alcohol-type aqueous film- forming foam or water spray for large fires.

Special fire-fighting procedures:

*If potential for exposure to vapors or products of combustion exists, wear complete personal protective equipment, including self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive-pressure mode. Water spray can be used to reduce intensity of flames and to dilute spills to nonflammable mixture. Water may be ineffective but should be used to cool fire-exposed structures and vessels.

Unusual fire and explosion hazards: None.

REACTIVITY DATA

Stability: Stable.

Hazardous polymerization: Will not occur.

Conditions to avoid: Flame.

Materials to avoid:

Oxidizing agents, for example, hydrogen peroxide, nitric acid, perchloric acid or chromium trioxide; strong alkalis such as sodium hydroxide (caustic soda).

Hazardous combustion or decomposition products: Carbon monoxide.

HEALTH HAZARD DATA

Acute:

Ingestion (swallowing):

Causes severe irritation and damage to mouth, throat and stomach. Slightly toxic to animals (oral LD₅₀, rats: 3.5 g/kg).

The above information is believed to be accurate to the best of our knowledge.
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Inhalation (breathing):

Severely irritating to nasal passages, throat and lungs. Can cause pulmonary edema (accumulation of fluid in the lungs); signs and symptoms can be delayed for several hours. Propionic acid has a low degree of acute toxicity following inhalation of the vapor (rats, 5.5 mg/l, 4-hrs).

Skin contact:

Can cause severe injury (reddening and swelling). Sensitization can occur. Moderately toxic to animals by absorption, (dermal LD₅₀, rabbits: 0.5 g/kg)

Eye contact:

Can cause chemical burn - damage irreversible. Vapors are severely irritating.

Chronic:

Mutagenicity: No information.

Carcinogenicity: No information.

Reproduction: No information.

Medical conditions aggravated by exposure:

Significant exposure to this chemical may adversely affect people with chronic disease of the respiratory system, skin and/or eyes.

FIRST AID MEASURES

Ingestion (swallowing):

Patient should be made to drink large quantities of water. Contact a physician immediately.

Inhalation (breathing):

Remove patient from contaminated area. If breathing has stopped, give artificial respiration, then oxygen if needed. Contact a physician immediately.

Skin contact:

Remove contaminated clothing and wash contaminated skin with large amounts of water. If irritation persists, contact a physician.

Eye contact: Flush eyes with water for at least 15 minutes. Contact a physician immediately.

PREVENTATIVE MEASURES

***Respiratory protection:**

Based on contamination level and working limits of the respirator, use a respirator approved by NIOSH/MSHA (the following are the minimum recommended equipment).

For propionic acid concentrations:

>10 ppm and < or = 100 ppm- Air-purifying respirator with full facepiece and organic vapor cartridge(s) or air-purifying full facepiece respirator with an organic vapor canister or a full facepiece powered air-purifying respirator fitted with organic vapor cartridge(s).

>100 ppm and <1000 ppm - Positive-pressure full facepiece supplied-air respirator, or continuous-flow full facepiece supplied-air respirator.

> or = 1000 ppm or unknown concentration (such as in emergencies) - Positive- pressure self-contained breathing apparatus with full facepiece. Positive- pressure supplied-air respirator with full facepiece equipped with an auxiliary positive-pressure self-contained breathing apparatus escape system.

Escape - Positive-pressure self-contained breathing apparatus with full facepiece or any supplied-air respirator designed and approved for escape.

Ventilation

Local exhaust: Recommended when appropriate to control employee exposure.

Mechanical (general): Not recommended as the sole means of controlling employee exposure.

Protective gloves: Neoprene or rubber.

Eye protection: Chemical safety goggles.

*Additional protective equipment:

For operations where spills or splashing can occur, use chemical protective clothing, including gloves and boots. A safety shower and eye bath should be readily available.

*Precautions to be taken in handling and storing:

Store in well-ventilated area. Keep away from sparks and flame. Keep containers closed when not in use. Always open containers slowly to allow any excess pressure to vent. Use only approved containers. When transferring follow proper grounding procedures. Use with adequate ventilation. Avoid breathing vapor. Avoid contact with eyes, skin and clothing. Wash thoroughly with soap and water after handling. Decontaminate soiled clothing thoroughly before re-use. Discard contaminated leather clothing.

ENVIRONMENTAL PROTECTION DATA

*Steps to be taken if material is released or spilled:

Eliminate ignition sources. Avoid eye or skin contact; see "Special protection information" section for respirator information. Place leaking containers in well-ventilated area with spill containment. If fire potential exists, blanket spill with alcohol-type aqueous film- forming foam or use water spray to disperse vapors. Contain spill to facilitate clean-up. Clean-up methods may include absorbent materials, vacuum truck, etc. Avoid runoff into storm sewers and ditches which lead to natural waterways. If an odor or acidity problem exists, neutralize with lime or sodium bicarbonate.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PYRIDINE****0463**

PRODUCT INFORMATION

Chemical name(s) : PYRIDINE

Chinese Name: 氮<雜>苯

Synonyms: Azabenzene

CAS No: 110-86-1

Molecular Weight: 79.10

Chemical Formula: C₅H₅N

RISK SYMBOL



PHYSICAL DATA

Appearance: Colorless to yellow liquid.

Boiling Point: 115.3°C (239°F)

Odor: Penetrating, sickening.

Melting Point: -42°C (-44°F)

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Solubility: Miscible in water.
Vapor Density (Air=1): 2.72
Specific Gravity: 0.98 @ 25°C/4°C
Vapor Pressure (mm Hg): 18 @ 20°C (68°F)
pH: 8.5
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: 20°C (68°F) CC
Autoignition temperature: 482°C (900°F)
Flammable limits in air % by volume:
LEL: 1.8; UEL: 12.4
Flammable Liquid Contact with strong oxidizers may cause fire.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool. Water may be ineffective.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Heat will contribute to instability.

Hazardous Decomposition Products:

May form cyanide fumes and oxides of carbon and nitrogen if heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Heat, flame, maleic anhydride, perchromates, strong acids, strong oxidizers. Will attack some forms of plastics, rubber, and coatings.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. FLAMMABLE LIQUID AND VAPOR. CAUSES SEVERE IRRITATION TO EYES, SKIN AND RESPIRATORY TRACT.

Potential Health Effects

Inhalation:

Inhalation causes severe irritation to the respiratory tract. Symptoms of overexposure include headache, dizziness, nausea, shortness of breath, coughing, insomnia, diarrhea, gastrointestinal disturbances, and back pain with urinary frequency. Liver and kidney damage may occur. May be fatal.

Ingestion:

Toxic effects parallel those of inhalation. Oral doses of several ounces have been fatal to humans.

Skin Contact:

Causes severe irritation, possibly burns, to the skin. Symptoms include redness and severe pain. Absorption through the skin may occur, resulting in toxic effects similar to inhalation. May act as a photosensitizer.

Eye Contact:

Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure: Liver and kidney damage has been reported.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin, eye or central nervous system disorders, or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, give large quantities of water to drink and get medical attention immediately. Never give anything by mouth to an unconscious person.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 5 ppm (TWA)
- ACGIH Threshold Limit Value (TLV): 5 ppm (TWA)
- NIOSH Recommended Exposure Limit (REL): 5 ppm (Ceiling)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PYROGALLIC ACID****0464****PRODUCT INFORMATION**

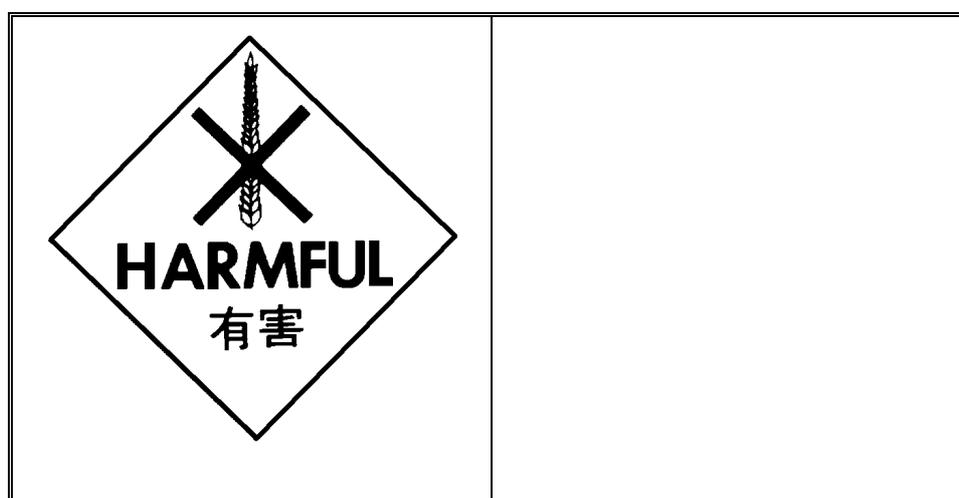
Chemical name(s) : PYROGALLIC ACID

Chinese Name: 焦棓酸, 焦性沒食子酸

Synonyms: 1,2,3-Trihydroxybenzene; pyrogallol; 1,2,3-benzenetriol

CAS No: 87-66-1

Molecular Weight: 126.11

Chemical Formula: $C_6H_3(OH)_3$ **RISK SYMBOL****PHYSICAL DATA**

Appearance: White to slightly yellow plates and powder.

Boiling Point: 309°C (588°F)

Odor: Characteristic odor.

Melting Point: 131 - 133°C (268 - 271°F)

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Solubility: ca. 60g/100ml water @ 20°C (68°F).
Vapor Density (Air=1): 4.4
Density: 1.45
Vapor Pressure (mm Hg): 10 @ 167.7°C (334°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Darkens on exposure to air or light.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Oxygen, oxidizing agents, alkalis, ammonia, iodine, iron and lead salts, and phenol.

Conditions to Avoid: Air, heat, and light.

HEALTH HAZARD DATA

Emergency Overview

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE RESPIRATORY SYSTEM, LIVER, KIDNEYS, EYES, SKIN AND BLOOD.

Potential Health Effects

Inhalation:

Irritant. May be absorbed through the lungs. Can cause coughing, sneezing or difficulty in breathing.

Ingestion:

Toxic substance. Ingestion can lead to severe gastrointestinal irritation, vomiting, and diarrhea. Pyrogalllic acid absorbed through the alimentary canal can cause damage to the liver and kidneys, produce methemoglobinemia, circulatory collapse and death.

Skin Contact:

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Irritant. Causes redness and soreness. Pyrogalllic acid is readily absorbed through the skin and severe or fatal poisoning can occur.

Eye Contact: Causes irritation with redness and pain.

Chronic Exposure: Accumulation of pyrogalllic acid in the system affects the kidneys and liver.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Store in a cool, dry, ventilated area away from sources of heat or ignition. Isolate from oxidizing materials. Protect from direct sunlight. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8.

Spills:

Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SAFRANINE O****0465****PRODUCT INFORMATION**

Chemical name(s) : SAFRANINE O

Chinese Name: 藏花紅

Synonyms: CI 50240; basic red 2

CAS No: 477-73-6

Molecular Weight: 350.85

Chemical Formula: C₂₀H₁₉N₄Cl**RISK SYMBOL**

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PHYSICAL DATA

Appearance: Dark rusty crystals or dark green powder.

Boiling Point: No information found.

Odor: Odorless.

Melting Point: No information found.

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Soluble in water.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, nitrogen oxides and hydrogen chloride when heated to decomposition.

Hazardous Polymerization: Will not occur.
Incompatibilities: No information found.
Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview: Warning! Causes irritation to eyes and skin.
Potential Health Effects
Information on the human health effects from exposure to this substance is limited.
Inhalation: No information found, but compound should be handled as a potential health hazard.
Ingestion: No information found, but compound should be handled as a potential health hazard.
Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.
Eye Contact: Causes irritation, redness, and pain.
Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:

There is insufficient data in the published literature to assign complete numerical SAF-T-DATA* ratings and laboratory protective equipment for this product. Special precautions must be used in storage, use and handling. Protective equipment for laboratory bench use should be chosen using professional judgment based on the size and type of reaction or test to be conducted and the available ventilation, with overriding consideration to minimize contact with the chemical.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**Silica Gel G****0466**

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PRODUCT INFORMATION

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Chemical name(s) : Silica Gel G / HR

Chinese Name: 矽膠, 矽膠

Synonyms: None

CAS No: 7631-86-9

Molecular Weight: Not available.

Chemical Formula: Not available.

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RISK SYMBOL=====

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PHYSICAL DATA

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Appearance: White amorphous powder.

Boiling Point: No information found.

Odor: Odorless.

Melting Point: No information found.

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Negligible (< 0.1%)
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information: Use protective clothing and breathing equipment appropriate for the surrounding fire.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Oxides of carbon and silicon may be formed when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities:
 Reacts with hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, and oxidizers.
Conditions to Avoid: Moisture, extreme heat, and incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Caution! May cause irritation to skin, eyes, and respiratory tract.
Potential Health Effects
 This product contains synthetic amorphous silica, not to be confused with crystalline silica such as quartz, cristobalite or tridymite or with diatomaceous earth or other naturally occurring forms of amorphous silica that frequently contain crystalline forms.
Inhalation:
 May cause dryness and irritation to mucous membranes, nose, and throat. Symptoms may include coughing, sore throat, and wheezing.
Ingestion: No adverse effects expected.
Skin Contact: May cause irritation with dryness and abrasion.
Eye Contact: May cause irritation, redness and pain.
Chronic Exposure:

Repeated exposure may cause symptoms similar to those listed for acute effects. Synthetic amorphous silica does not produce silicosis.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

Silica (synthetic, amorphous):

- OSHA Permissible Exposure Limit (PEL) -

80/(%SiO₂) mg/m³ (TWA) for amorphous silica, including natural diatomaceous earth.

- ACGIH Threshold Limit Value (TLV) -

10 mg/m³ (TWA) for amorphous precipitated silica and amorphous silica gel.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. When pouring into a container of flammable liquid, ground both containers electrically to prevent a static electric spark. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM BENZOATE****0467**

PRODUCT INFORMATION

Product name(s) : SODIUM BENZOATE

Chinese Name: 苯<甲>酸鈉

Synonyms: Benzoic Acid, sodium salt; Benzoate of soda; Sodium benzoic acid; Antimol

CAS No: 532-32-1

Molecular Weight: 144

Chemical Formula: $C_7H_5NaO_2$

RISK SYMBOL

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PHYSICAL DATA

Appearance: White granules or crystalline powder.

Boiling Point: Not applicable.

Odor: Odorless.

Melting Point: $> 300^{\circ}C$ ($> 572^{\circ}F$)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Soluble in water. (1 gm/2 ml water)
Vapor Density (Air=1): No information found.
Density: 1.44
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Water spray can be used to extinguish fires and cool fire-exposed containers.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Thermal decomposition may produce carbon dioxide, carbon monoxide, and/or benzoic acid.

Hazardous Polymerization: This substance does not polymerize.

Incompatibilities: Acids, ferric salts, strong oxidizers.

Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

Caution! May be harmful if swallowed or inhaled. May cause irritation to skin, eyes, and respiratory tract. May form combustible dust concentrations in air.

Potential Health Effects

Inhalation: May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.

Ingestion: Large oral doses may cause irritation to the gastrointestinal tract.

Skin Contact: May cause irritation with redness and pain.

Eye Contact: May cause irritation, redness and pain.

Chronic Exposure: No information found.
Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Avoid dust formation and control ignition sources. Employ grounding, venting and explosion relief provisions in accord with accepted engineering practices in any process capable of generating dust and/or static electricity. Empty only into inert or non-flammable atmosphere. Emptying contents into a non-inert atmosphere where flammable vapors may be present could cause a flash fire or explosion due to electrostatic discharge. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**Sodium Bromide****0468**

PRODUCT INFORMATION

CHEMICAL NAME: Sodium Bromide

Chinese Name: 溴化鈉

CAS NO.: 7647-15-6

CHEMICAL FORMULA: NaBr

CHEMICAL FAMILY: Metal Bromide

RISK SYMBOL

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PHYSICAL DATA

APPEARANCE/ODOR: White crystalline or granular solid/odorless.

BOILING POINT: 1390°C/2534°F.

VAPOR PRESSURE: Not applicable.

SOLUBILITY IN WATER: 733 g/l at 20°C/60F.

SPECIFIC GRAVITY: 3.2

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EVAPORATION RATE: Not applicable.
PERCENT VOLATILE: 0.00
MOLECULAR WEIGHT: 102.9 g
MELTING POINT: 755°C/1391°F
pH: 5.5 to 8 for 5% sol.

FIRE AND EXPLOSION DATA

FLASH POINT(METHOD): Non-combustible.
FLAMMABLE LIMITS: Not applicable.
EXTINGUISHING MEDIA: Non-combustible material. Use extinguishing method appropriate for surrounding fire.
SPECIAL FIRE FIGHTING PROCEDURES: Avoid breathing fumes.
HAZARDOUS THERMAL DECOMPOSITION PRODUCTS: Includes bromine.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None known.

REACTIVITY DATA

STABILITY: Stable.
CONDITIONS TO AVOID: Product is hygroscopic -- avoid contact with water and moist air.
MATERIALS TO AVOID: Strong acids, bases, oxidizing agents, alkaloidal, and heavy metal salts.
HAZARDOUS POLYMERIZATION: Will not occur.

HEALTH HAZARD DATA

INHALATION: Not expected to be a primary route of exposure.
EYE CONTACT: May cause eye irritation.
SKIN CONTACT: Prolonged or repeated exposure may cause skin irritation.
INGESTION: Not expected to be acutely toxic.
CHRONIC EFFECTS OF OVEREXPOSURE: None known.

FIRST AID MEASURES

INHALATION: If inhaled, remove to fresh air.
EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
SKIN CONTACT: Wash contaminated areas with soap and water.
INGESTION: Give two glasses of water. Do not induce vomiting. Get medical attention.

PREVENTATIVE MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

EXPOSURE LIMITS: Not established by OSHA/ACGIH.
EYE PROTECTION: Chemical goggles and face shield.
PROTECTIVE GLOVES: Resistant to chemical penetration.
RESPIRATORY PROTECTION: None under normal conditions.
LOCAL EXHAUST VENTILATION: Not required.
MECHANICAL VENTILATION: Recommended.
OTHER:

If repeated or prolonged skin contact or contamination of clothing is likely, protective clothing should be worn.
STORAGE REQUIREMENTS: Store in well-ventilated, cool, dry area. Close container when not in use.

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ENVIRONMENTAL PROTECTION DATA
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SPILLS OR LEAKS: Sweep or shovel spills into appropriate container for disposal.

DISPOSAL METHODS:

To the best of Albemarle's knowledge, this product is not regulated by CERCLA/RCRA as a hazardous waste or material. However, this product has not been tested for the toxicity characteristic via the Toxicity Characteristic Leaching Procedure. Therefore, it may be disposed of as an industrial waste in a manner acceptable to good waste management practice and in compliance with applicable local, state and federal regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM CHLORATE****0469****PRODUCT INFORMATION**

Chemical name(s) : SODIUM CHLORATE

Chinese Name: 氯(V)酸鈉

Synonyms: Soda chlorate; chlorax; chloric acid, sodium salt

CAS No: 7775-09-9

Molecular Weight: 106.44

Chemical Formula: NaClO₃**RISK SYMBOL****PHYSICAL DATA**

Appearance: White crystals.

Boiling Point: No information found.

Odor: Odorless.

Melting Point: 248°C (478°F)

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Solubility: 100g/100ml water @ 20°C (68°F).
Vapor Density (Air=1): No information found.
Density: 2.5
Vapor Pressure (mm Hg): No information found.
pH: Aqueous solution is neutral.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. When heated, it releases oxygen which increases combustion.

Explosion:

Contact with oxidizable substances may cause extremely violent combustion. Sealed containers may rupture when heated. Sensitive to mechanical impact. Sensitive to static discharge.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

May emit toxic chloride fumes when heated to decomposition. May emit toxic chloride fumes and sodium oxide when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Aluminum, strong acids, strong reducing agents, organic matter and other oxidizable substances.

Conditions to Avoid: Heat, flame, ignition sources, shock, friction, incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Danger! Strong oxidizer. Contact with other material may cause fire. Harmful if swallowed. Causes irritation to skin, eyes and respiratory tract. Exposure may cause methemoglobinemia, liver or kidney damage.

The above information is believed to be accurate to the best of our knowledge.
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Potential Health Effects

Inhalation:

Inhalation of dust may cause irritation to the respiratory tract; symptoms may include sore throat, coughing, headache, and dizziness.

Ingestion:

Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. May cause abdominal pain, hemolysis, methemoglobinemia, cyanosis, anuria, coma, and convulsions. May cause liver and kidney damage. Death may occur from renal failure, generally in 4 days. Estimated lethal dose from 15 to 30 grams.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure:

Repeated ingestion of small amounts may cause loss of appetite and weight loss. Chronic exposure may cause kidney effects.

Aggravation of Pre-existing Conditions: No information found.

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FIRST AID MEASURES

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Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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PREVENTATIVE MEASURES

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Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage and moisture. Isolate from any source of heat or ignition. Avoid storage on wood floors. Separate from incompatibles, combustibles, organic or other readily oxidizable materials. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

City University of Hong Kong

MSDS SODIUM ACETATE ANHYDROUS 0470

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PRODUCT INFORMATION

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Chemical name(s) : SODIUM ACETATE ANHYDROUS

Chinese Name: 乙酸钠

Synonyms: Sodium acetate anhydrous; Acetic acid, sodium salt

CAS No: 127-09-3

Molecular Weight: 82.03

Chemical Formula: CH₃COONa

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RISK SYMBOL=====

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PHYSICAL DATA

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Appearance: White hygroscopic crystals.

Boiling Point: Not applicable.

Odor: Odorless.

Melting Point: 324°C (615°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: 119 g/100 g cold water
Vapor Density (Air=1): No information found.
Density: 1.53
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Autoignition temperature: 611°C (1132°F)
Combustible. May pose a fire hazard when exposed to elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Hygroscopic powder.

Hazardous Decomposition Products: Emits fumes of acetic acid upon heating and on contact with strong acids.

Hazardous Polymerization: Will not occur.

Incompatibilities: Nitric acid, fluoride, potassium nitrate, strong oxidizers and diketene.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Caution! May cause irritation to skin, eyes, and respiratory tract.

Potential Health Effects

Inhalation:

May cause irritation to the respiratory tract. Symptoms may include coughing, sore throat, labored breathing, and chest pain.

Ingestion: Large doses may produce abdominal pain, nausea, and vomiting.

Skin Contact: May cause irritation with redness and pain.

Eye Contact: May cause irritation, redness and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 15 mg/m³ total dust, 5 mg/m³ respirable fraction for nuisance dusts.
- ACGIH Threshold Limit Value (TLV):
10 mg/m³ total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. Small amounts of residue may be flushed to sewer with plenty of water.

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Appearance: Colorless or white, granular salt.
Boiling Point: Not applicable.
Odor: Odorless.
Melting Point: 48.1°C (118°F) Loses 5 H₂O
Solubility: Soluble in water.
Vapor Density (Air=1): No information found.
Density: 1.7
Vapor Pressure (mm Hg): No information found.
pH: 9.5
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Sodium and phosphorus oxides may form when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities: Acids, alkaloids, lead acetate, antipyrine, chloral hydrate, resorcinol and pyrogallol.
Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Caution! May cause irritation to skin, eyes, and respiratory tract. May be harmful if swallowed or inhaled.

Potential Health Effects

Inhalation:

May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.

Ingestion:

Phosphates are slowly and incompletely absorbed when ingested, and seldom result in systemic effects. Such effects, however, have occurred. Symptoms may include vomiting, lethargy, diarrhea, blood chemistry effects, heart disturbances and central nervous system effects. The toxicity of phosphates is because of their ability to sequester calcium.

Skin Contact: May cause irritation with redness and pain.

Eye Contact: May cause irritation, redness and pain.

Chronic Exposure:

May sequester calcium and cause calcium phosphate deposits in the kidneys. Chronic ingestion or inhalation may induce systemic phosphorous poisoning. Liver damage, kidney damage, jaw/tooth abnormalities, blood disorders and cardiovascular effects can result.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, jaw/tooth abnormalities, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

In general, dilution ventilation is a satisfactory health hazard control for this substance. However, if conditions of use create discomfort to the worker, a local exhaust system should be considered.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn.

For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. Small amounts of residue may be flushed to sewer with plenty of water. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM BISULFITE****0472**

PRODUCT INFORMATION

Chemical name(s) : SODIUM BISULFITE

Chinese Name: 重硫酸鈉

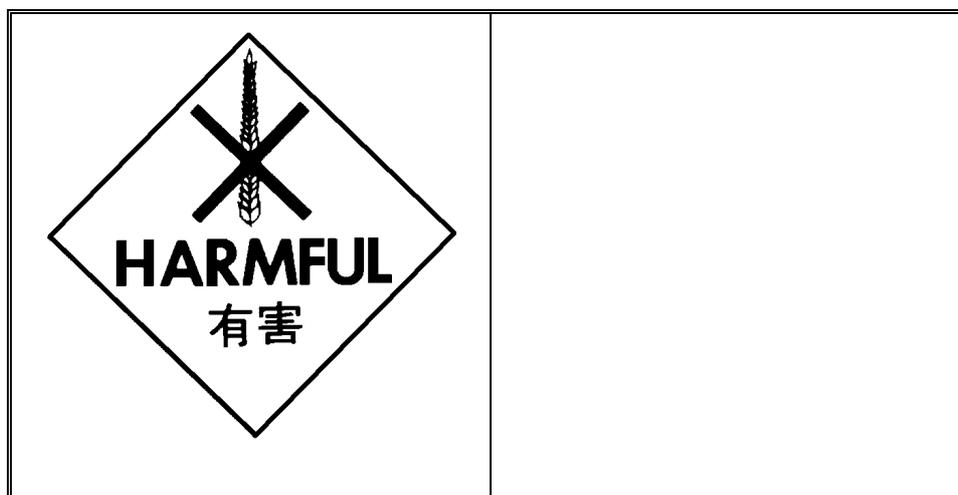
Synonyms: Sodium acid sulfite; Sulfurous acid, monosodium salt; Sodium hydrogen sulfite, solid

CAS No: 7631-90-5

Molecular Weight: 104.06

Chemical Formula: Usually a mixture of NaHSO_3 (sodium bisulfite) and $\text{Na}_2\text{S}_2\text{O}_5$ (sodium metabisulfite)

RISK SYMBOL



PHYSICAL DATA

Appearance: Coarse white granules.

Boiling Point: Not applicable.

Odor: Slight odor of sulfur dioxide.

Melting Point: 150°C (302°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Very soluble in water, insoluble in alcohol.
Vapor Density (Air=1): No information found.
Specific Gravity: 1.48
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Strength diminishes somewhat with age. Gradually decomposes in air to sulfate, generating sulfurous acid gas.
Contact with moisture (water, wet ice, etc.), Will release toxic sulfur dioxide gas.

Hazardous Decomposition Products: Burning may produce sulfur oxides.
Hazardous Polymerization: Will not occur.
Incompatibilities: Water, acids, alkalis, sodium nitrite, oxidizers, aluminum powder.
Conditions to Avoid: Moisture, heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Harmful if swallowed or inhaled. May cause allergic respiratory reaction. Causes irritation to skin, eyes and respiratory tract. Reacts with acids and water releasing toxic sulfur dioxide gas.

Potential Health Effects

Inhalation:

Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. May cause allergic reaction in sensitive individuals.

Ingestion:

May cause gastric irritation by the liberation of sulfurous acid. An asthmatic reaction may occur after ingestion. Large doses may result in nausea, vomiting, diarrhea, abdominal pains, circulatory disturbance, and central nervous system depression. Estimated fatal dose is 10 gm.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact:

Causes irritation, redness, and pain. Contact may cause irreversible eye damage. Symptoms may include stinging, tearing, redness, swelling, corneal damage and blindness.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions:

Some individuals are said to be dangerously sensitive to minute amounts of sulfites in foods. Symptoms may include broncho constriction, shock, gastrointestinal disturbances, angio edema, flushing, and tingling sensations. Once allergy develops, future exposures can cause asthma attacks with shortness of breath, wheezing, and cough.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-ACGIH Threshold Limit Value (TLV):

5mg/m³ (TWA) for sodium bisulfite & for sodium metabisulfite, A4 Not classifiable as a human carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face respirator with an acid gas cartridge may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Releases toxic sulfur dioxide gas when in contact with water, ice. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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ENVIRONMENTAL PROTECTION DATA

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Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Cautiously spray residue with plenty of water, providing ventilation to clear sulfur dioxide fumes generated from water contact. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM IODIDE****0473**

PRODUCT INFORMATION

Chemical Name(S) : Sodium Iodide

Chinese Name: 碘化鈉

Synonyms: Sodium iodine; Sodium monoiodide

CAS No: 7681-82-5

Molecular Weight: 149.89

Chemical Formula: NaI

RISK SYMBOL

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PHYSICAL DATA

Appearance: White granular or colorless crystals

Boiling Point: 1300°C (2372°F)

Odor: Odorless.

Melting Point: 651°C (1204°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: 184 g/100 ml water @ 25°C
Vapor Density (Air=1): No information found.
Specific Gravity: 3.67
Vapor Pressure (mm Hg): 1 @ 767°C (1413°F)
pH: 8 - 9.5
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:
Stable under ordinary conditions of use and storage. Absorbs up to 5% moisture on exposure to air and becomes brown due to liberation of iodine.

Hazardous Decomposition Products:
When heated to decomposition it emits toxic fumes of iodine and sodium oxide.

Hazardous Polymerization: Will not occur.

Incompatibilities:
Alkali metals, chloral hydrate, acids tartaric acid, potassium chlorate, metallic salts, iodine. Reacts violently with bromide trifluoride, perchloric acid, and oxidants.

Conditions to Avoid: Light and incompatibles.

HEALTH HAZARD DATA

Emergency Overview
Warning! Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. Chronic exposure may produce iodism

Potential Health Effects
Inhalation:
Inhalation of dust may cause coughing, choking, with variable symptoms of headache, dizziness, and weakness. May cause lung edema.

Ingestion:

Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure:

A mild toxic syndrome "iodism" may result from chronic iodide overdoses. May cause salivation, sneezing, conjunctivitis, headache, fever, laryngitis, bronchitis, stomatitis, and parotitis (iodine mumps). Prolonged or repeated skin exposure may cause skin rashes.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Protect from light. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Small amounts of residue may be flushed to sewer with plenty of water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM PEROXIDE****0474**

PRODUCT INFORMATION

Chemical name(s) : SODIUM PEROXIDE

Chinese Name: 過氧化鈉

Synonyms: Disodium dioxide; disodium peroxide

CAS No: 1313-60-6

Molecular Weight: 77.98

Chemical Formula: Na₂O₂

RISK SYMBOL



PHYSICAL DATA

Appearance: White to pale yellow granules.

Boiling Point: 657°C (1215°F)

Odor: Odorless.

Melting Point: 460°C (860°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Reacts violently in water.
Vapor Density (Air=1): No information found.
Density: 2.81
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

Explosion:

Contact with combustible, organic, or oxidizable substances may cause extremely violent combustion. May react explosively in contact with large amounts of water.

Fire Extinguishing Media:

Dry chemical or pulverized dolomite. DO NOT USE WATER, CARBON DIOXIDE, HALOCARBON or Wet Chemical Extinguishers.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Water reactive.

Hazardous Decomposition Products:

Emits oxygen when heated to decomposition which may increase a fire hazard. Toxic oxides of sodium and metallic sodium fumes may also be released.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Moisture, organic and oxidizable substances, acetic acid, acetic anhydride, aluminum, aluminum plus carbon dioxide, ammonium persulfate, aniline, antimony, arsenic, benzene, boron nitride, calcium carbide, charcoal, dextrose plus potassium nitrate, diethyl ether, glycerine, hexamethylenetetramine, hydrogen sulfide, magnesium, magnesium plus carbon dioxide, manganese dioxide, organic matter, phosphorus, potassium selenium monochloride, silver chloride plus charcoal, sodium, sulfur monochloride, tin, and zinc, reducing agents.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
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Emergency Overview

Danger! Corrosive. Strong oxidizer. Contact with other material may cause fire. Causes severe burns to every area of contact. Harmful if swallowed or inhaled.

Potential Health Effects

Inhalation:

Extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Ingestion:

Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach. Can cause sore throat, vomiting, diarrhea.

Skin Contact: Corrosive. Symptoms of redness, pain, and severe burn can occur.

Eye Contact: Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source,

preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Protect from moisture. Separate from combustible, organic, or any other readily oxidizable materials. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Clean-up personnel should wear protective clothing and respiratory equipment suitable for toxic or corrosive fluids or vapors. Do not save for reclamation. Cover with double volume of sand-soda ash mixture (90%-10%). Mix thoroughly and break up any lumps of peroxide. As an alternate, with a plastic scoop, add mixture slowly to a large amount of water with stirring. Neutralize with dilute sulfuric acid. When settled decant the sulfate solution into the drain with excess water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Sodium Persulfate****0475**

PRODUCT INFORMATION

Chemical name(s) : Sodium Persulfate

Chinese Name: 過二硫酸鈉

Synonyms: Sodium Peroxydisulfate; Peroxydisulfuric Acid, Disodium Salt

CAS No: 7775-27-1

Molecular Weight: 238.03

Chemical Formula: Na₂O₈S₂

RISK SYMBOL



PHYSICAL DATA

Appearance: White powder.

Boiling Point: No information found.

Odor: Odorless.

Melting Point: 180°C (356°F) Decomposes.

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Appreciable (> 10%)
Vapor Density (Air=1): No information found.
Specific Gravity: 2.40
Vapor Pressure (mm Hg): No information found.
pH: 6.0 (1% solution)
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Heating or contact with water releases oxygen which may intensify combustion in an existing fire.

Explosion:

An explosion hazard when mixed with finely powdered organic matter, metal powder, or reducing agents. Strong oxidants may explode when shocked, or if exposed to heat, flame, or friction. Also may act as initiation source for dust or vapor explosions.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Do not use water.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Sealed containers may rupture when heated.

REACTIVITY DATA

Stability:

Unstable. Gradually decomposes losing oxygen. Decomposes more rapidly at higher temperatures. Stability decreases in the presence of moisture. Metals other than stainless steel are apt to cause decomposition of persulfate solutions.

Hazardous Decomposition Products: Oxides of sulfur and the contained metal. Oxygen is released.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Reducing agents, organic material, sodium peroxide, water and powdered metals especially aluminum.

Conditions to Avoid: Moisture, heat, flame, ignition sources, shock, friction, incompatibles.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Emergency Overview

Danger! Strong oxidizer. Contact with other material may cause fire. Harmful if swallowed or inhaled. May cause burns to skin and eyes. Causes respiratory tract irritation. May cause allergic skin or respiratory reaction.

Potential Health Effects

There is limited information available on the hazards of this chemical. The health effects listed for this substance are based on information found for compounds of similar structure.

Inhalation:

Causes irritation to the respiratory tract. Symptoms may include sore throat, shortness of breath, inflammation of nasal passages, coughing, and wheezing. May cause lung edema, a medical emergency. Any exposure may cause an allergic reaction. Asthma-like symptoms and life-threatening shock may result.

Ingestion:

Causes severe irritation and possible burns to the mouth and throat. Gastrointestinal disturbances may be expected with nausea, abdominal pain, and vomiting.

Skin Contact:

Causes severe irritation or burns. Symptoms include redness, itching and pain. May cause allergic skin reactions.

Eye Contact: Can cause severe irritation or burns with eye damage.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions:

Persons with impaired respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- ACGIH Threshold Limit Value (TLV): 0.1 mg/m³ (TWA), Persulfates, Sodium

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage and moisture. Isolate from any source of heat or ignition. Avoid storage on wood floors. Separate from incompatibles, combustibles, organic or other readily oxidizable materials. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

=====
ENVIRONMENTAL PROTECTION DATA
=====

Remove all sources of ignition. Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Do not contact with water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SODIUM SULFITE****0476****PRODUCT INFORMATION**

Chemical name(s) : SODIUM SULFITE

Chinese Name: 亞硫酸鈉

Synonyms: Sodium sulfite anhydrous; disodium sulfite; sulfurous acid, disodium salt; exsiccated sodium sulfite

CAS No: 7757-83-7

Molecular Weight: 126.04

Chemical Formula: Na₂SO₃**RISK SYMBOL**

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PHYSICAL DATA

Appearance: White crystals.

Boiling Point: Not applicable.

Odor: Odorless.

Melting Point: No information found.

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Soluble in ca. 3.2 parts water.
Vapor Density (Air=1): No information found.
Specific Gravity: 2.6 @ 15.4°C (60°F)
Vapor Pressure (mm Hg): No information found.
pH: ca. 9
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

Not considered to be a fire hazard. If involved in a fire, can emit toxic fumes and irritating and corrosive gases.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Stable under ordinary conditions of use and storage. Heat and moisture contribute to instability. May air-oxidize.

Hazardous Decomposition Products: Burning may produce sulfur oxides.

Hazardous Polymerization: Will not occur.

Incompatibilities: Acids, strong oxidizers, high temperatures.

Conditions to Avoid: Heat and moisture.

HEALTH HAZARD DATA

Emergency Overview

Warning! Harmful if swallowed. May cause allergic reaction and breathing difficulties. May cause irritation to skin, eyes, and respiratory tract.

Potential Health Effects

Although only moderately toxic in large amounts, sulfites can pose risk to some asthmatics producing central nervous system depression, bronchoconstriction and anaphylaxis.

Inhalation:

Inhalation of dust may cause irritation to the mucous membranes of the upper respiratory tract. Use of bronchodilators preserved with sulfites can cause allergic reactions.

Ingestion:

The above information is believed to be accurate to the best of our knowledge.
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May cause gastric irritation by the liberation of sulfurous acid. Large doses may result in circulatory disturbances, diarrhea, and central nervous system depression. Estimated fatal dose is 10g to 0.5 - > 5g/kg.

Skin Contact: May cause irritation.

Eye Contact: May cause irritation, redness and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions:

Some individuals are said to be dangerously sensitive to minute amounts of sulfites in foods and some bronchodilator medicines preserved with sulfites. Symptoms may include broncho constriction, shock, gastrointestinal disturbances, angio edema, flushing, and tingling sensations.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-ACGIH Threshold Limit Value (TLV):

5mg/m³ (TWA) for sodium bisulfite & for sodium metabisulfite, A4 Not classifiable as a human carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SUCCINIC ANHYDRIDE****0477****PRODUCT INFORMATION**

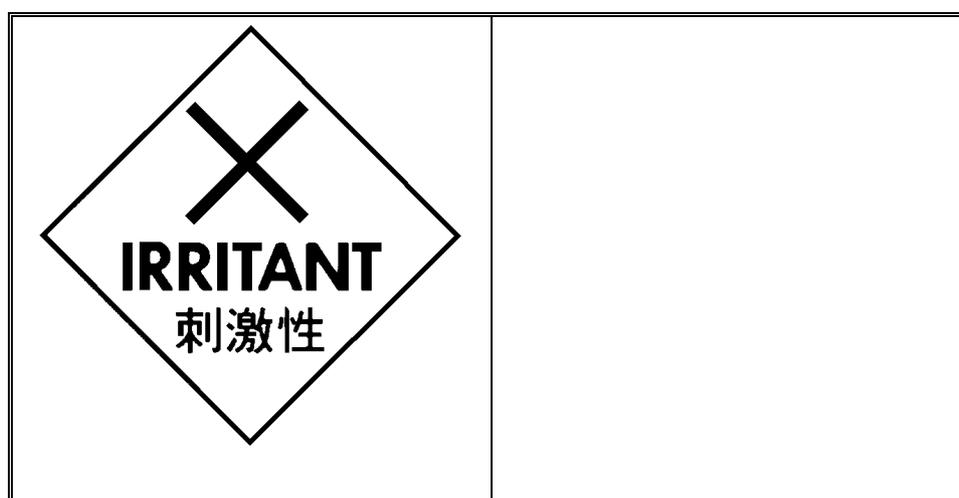
Chemical name(s) : SUCCINIC ANHYDRIDE

Chinese Name: 琥珀酐

Synonyms: 2,5-Furandione, dihydro-; succinyl oxide

CAS No: 108-30-5

Molecular Weight: 100.08

Chemical Formula: C₄H₄O₃**RISK SYMBOL****PHYSICAL DATA**

Appearance: Colorless crystals.

Boiling Point: 261°C (502°F)

Odor: Odorless.

Melting Point: 119 - 120°C (246 - 248°F)

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Insoluble in water.
Vapor Density (Air=1): No information found.
Density: 1.5
Vapor Pressure (mm Hg): 1 @ 92°C (198°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: Moisture and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Warning! Harmful if swallowed or inhaled. Causes severe eye irritation. Causes irritation to skin and respiratory tract.

Potential Health Effects

Information on the human health effects from exposure to this substance is limited. It is assumed that this material will behave similarly to other anhydrides.

Inhalation: Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.

Ingestion: Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact: Causes severe eye irritation with redness and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SUCROSE****0478**

PRODUCT INFORMATION

Chemical name(s) : SUCROSE

Chinese Name: 蔗糖

Synonyms: alpha-D-glucopyranosyl-beta-D-fructofuranoside; sugar

CAS No: 57-50-1

Molecular Weight: 342.3

Chemical Formula: C₁₂H₂₂O₁₁

RISK SYMBOL

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PHYSICAL DATA

Appearance: Monoclinic sphenoidal crystals.

Boiling Point: Not applicable.

Odor: Characteristic caramel.

Melting Point: 160 - 186°C (320 - 367°F)

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Solubility: 1 gm/0.5 ml water
Vapor Density (Air=1): No information found.
Density: 1.59
Vapor Pressure (mm Hg): No information found.
pH: Solutions are neutral to litmus.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Minimum explosible concentration in air: 0.045 g/l.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Oxidizers, sulfuric acid and nitric acid.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Caution! May form combustible dust concentrations in air. Nuisance dust. High concentrations may irritate eyes and respiratory tract.

Potential Health Effects

Inhalation:

Not expected to be a health hazard. Nuisance dust. Inhalation of high concentrations may cause coughing and upper respiratory tract irritation.

Ingestion: Extremely large oral dosages may produce gastrointestinal disturbances.

Skin Contact: No adverse effects expected.

Eye Contact: No adverse effects expected but dust may cause mechanical irritation.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

The above information is believed to be accurate to the best of our knowledge.
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FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact: Not expected to require first aid measures.

Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL): 15 mg/m³ total dust, 5 mg/m³ respirable fraction

-ACGIH Threshold Limit Value (TLV): 10 mg/m³ total dust containing no asbestos and < 1% crystalline silica

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Safety glasses.

Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

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MSDS**SUDAN III****0479**

PRODUCT INFORMATION

Chemical name(s) : SUDAN III

Chinese Name: 蘇丹 III

Synonyms:

Oil red; oil scarlet; CI 26100; Solvent Red 23; Sudan Red III; 2-naphthalenol, 1-((4-phenylazo) phenyl)azo-

CAS No: 85-86-9

Molecular Weight: 352.42

Chemical Formula: C₂₂H₁₆N₄O

RISK SYMBOL

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PHYSICAL DATA

Appearance: Reddish-brown powder.

Boiling Point: No information found.

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The above information is believed to be accurate to the best of our knowledge.
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Odor: No information found.
Melting Point: 199°C (390°F) Decomposes.
Solubility: Insoluble in water.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Burning may produce carbon monoxide, carbon dioxide, nitrogen oxides.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

HEALTH HAZARD DATA

Emergency Overview

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: No adverse health effects expected from inhalation.

Ingestion: Large doses may cause gastro-intestinal upset.

Skin Contact: No adverse effects expected.

Eye Contact: No adverse effects expected.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System: Not expected to require any special ventilation.

Personal Respirators (NIOSH Approved): Not expected to require personal respirator usage.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Use chemical safety goggles.

Other Control Measures:

There is insufficient data in the published literature to assign complete numerical SAF-T-DATA* ratings and laboratory protective equipment for this product. Special precautions must be used in storage, use and handling. Protective equipment for laboratory bench use should be chosen using professional judgment based on the size and type of reaction or test to be conducted and the available ventilation, with overriding consideration to minimize contact with the chemical.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

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MSDS**TETRACHLOROETHYLENE****0480****PRODUCT INFORMATION**

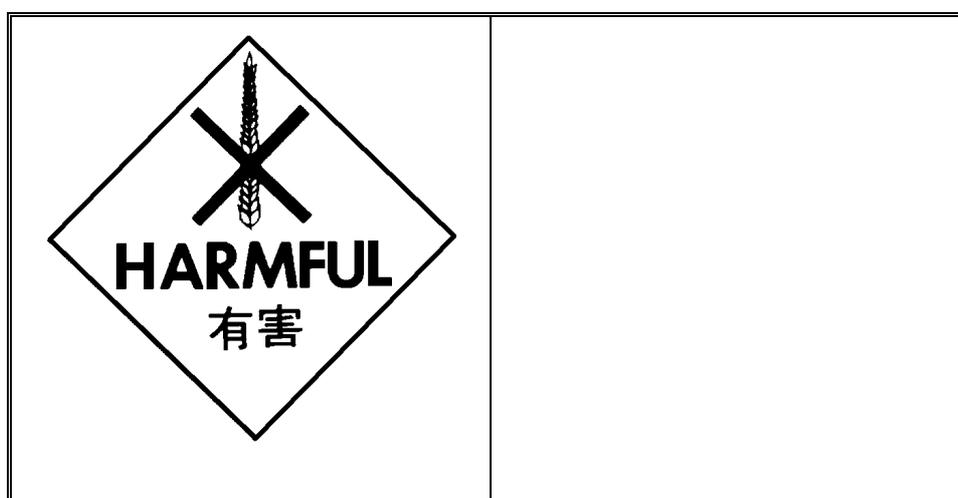
Chemical name(s) : TETRACHLOROETHYLENE

Chinese Name: 四氯乙烯

Synonyms: ethylene tetrachloride; tetrachloroethene; perchloroethylene; carbon bichloride; carbon dichloride

CAS No: 127-18-4

Molecular Weight: 165.83

Chemical Formula: $\text{Cl}_2\text{C}:\text{CCl}_2$ **RISK SYMBOL****PHYSICAL DATA**

Appearance: Clear, colorless liquid.

Boiling Point: 121°C (250°F)

Odor: Ethereal odor.

Melting Point: -19°C (-2°F)

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Solubility: 0.015 g in 100 g of water.
Vapor Density (Air=1): 5.7
Specific Gravity: 1.62 @ 20°C/4°C
Vapor Pressure (mm Hg): 18 @ 25°C (77°F)
pH: No information found.
Evaporation Rate (BuAc=1): 0.33 (trichloroethylene = 1)
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Not considered to be a fire hazard but becomes hazardous in a fire situation because of vapor generation and possible degradation to phosgene (highly toxic) and hydrogen chloride (corrosive). Vapors are heavier than air and collect in low-lying areas.

Explosion: Not considered to be an explosion hazard. Containers may explode when involved in a fire.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Stable under ordinary conditions of use and storage. Slowly decomposed by light. Deteriorates rapidly in warm, moist climates.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition. Hydrogen chloride gas and phosgene gas may be formed upon heating. Decomposes with moisture to yield trichloroacetic acid and hydrochloric acid.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Strong acids, strong oxidizers, strong alkalis, especially NaOH, KOH; finely divided metals, especially zinc, barium, lithium. Slowly corrodes aluminum, iron and zinc.

Conditions to Avoid: Moisture, light, heat and incompatibles.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
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Emergency Overview

Warning! Harmful if swallowed, inhaled or absorbed through skin. Causes irritation to skin, eyes and respiratory tract. Affects central nervous system, liver and kidneys. Suspect cancer hazard. May cause cancer. Risk of cancer depends on level and duration of exposure.

Potential Health Effects

Inhalation:

Irritating to the upper respiratory tract. Giddiness, headache, intoxication, nausea and vomiting may follow the inhalation of large amounts while massive amounts can cause breathing arrest, liver and kidney damage, and death. Concentrations of 600 ppm and more can affect the central nervous system after a few minutes.

Ingestion:

Not highly toxic by this route because of low water solubility. Used as an oral dosage for hookworm (1 to 4 ml). Causes abdominal pain, nausea, diarrhea, headache, and dizziness.

Skin Contact:

Causes irritation to skin. Symptoms include redness, itching, and pain. May be absorbed through the skin with possible systemic effects.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure:

May cause liver, kidney or central nervous system damage after repeated or prolonged exposures. Suspected cancer risk from animal studies.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance. The use of alcoholic beverages enhances the toxic effects.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician: Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):

100 ppm (TWA), 200 ppm (ceiling),
300 ppm/5min/3-hour (max)

-ACGIH Threshold Limit Value (TLV):

25 ppm (TWA), 100 ppm (STEL); listed as A3, animal carcinogen

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airtight hood, or full-facepiece self-contained breathing apparatus.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Store in a cool, dry, ventilated area away from sources of heat or ignition. Isolate from flammable materials. Protect from direct sunlight. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

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MSDS**THYMOL BLUE****0481****PRODUCT INFORMATION**

Chemical name(s) : THYMOL BLUE

Chinese Name: 百里酚藍

Synonyms:

Phenol, 4,4'-(3H-2,1-benzoxathiol-3-ylidene)bis(5-methyl-2 (1-methylethyl)-, S,S-dioxide; Thymolsulfonphthalein

CAS No: 76-61-9

Molecular Weight: 466.60

Chemical Formula: C₂₇H₃₀O₅S**RISK SYMBOL**

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PHYSICAL DATA

Appearance: Brownish-green powder.

Boiling Point: Not applicable.

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Odor: Characteristic odor.
Melting Point: 221 - 224°C (430 - 435°F)
Solubility: Insoluble in water.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Burning may produce carbon monoxide, carbon dioxide, sulfur oxides.

Hazardous Polymerization: Will not occur.

Incompatibilities: Strong oxidizers.

Conditions to Avoid: Dusting and incompatibles.

HEALTH HAZARD DATA

Emergency Overview: Caution! May cause irritation to skin, eyes, and respiratory tract.

Potential Health Effects

Specific hazard information about this compound was not found. However, composition and structure suggest that the compound can be harmful.

Inhalation:

May cause irritation to the respiratory tract. Symptoms may include coughing, sore throat, labored breathing, and chest pain.

Ingestion:

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The toxic effects of this substance have not been thoroughly investigated. Oral doses may have toxic effects.

Skin Contact: May cause irritation with redness and pain.

Eye Contact: May cause irritation, redness and pain.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Call a physician if irritation develops.

Eye Contact:

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Call a physician if irritation persists.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 15 mg/m³ total dust, 5 mg/m³ respirable fraction for nuisance dusts.

- ACGIH Threshold Limit Value (TLV):

10 mg/m³ total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container.

Material Safety Data Sheet

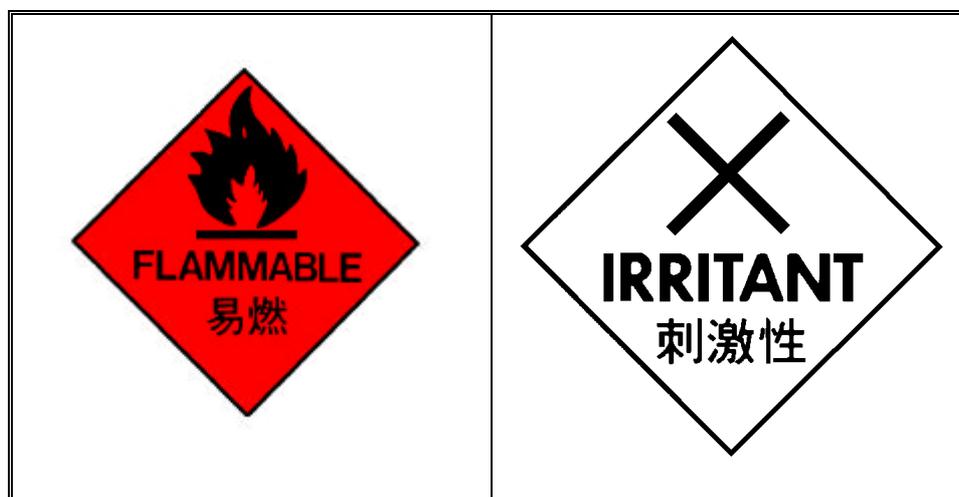
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MSDS**Triethylamine****0482**

PRODUCT INFORMATION

Chemical Name: Triethylamine
Chinese Name: 三乙<基>胺
Chemical Family: Alkylamines; Nitrogen
Compounds Formula: $(C_2H_5)_3N$
Synonyms: TETN, TEA
Molecular Weight: 101.19
CAS Number: 121-44-8

RISK SYMBOL



PHYSICAL DATA

Boiling Point, 760 mm Hg: 89.5°C
Vapor Pressure at 20°C: 54 mm Hg
% Volatiles by Volume: 100

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Freezing Point: -114.7°C
Vapor Density (air=1): 3.5
Specific Gravity (H₂O=1): .7290
Evaporation Rate: (BuAc=1) 3.5
Solubility in Water: 2% @ 20°C

FIRE AND EXPLOSION DATA

Flash Point (test method): -8°C (TCC)

Auto Ignition Temperature: 249°C

Flammable Limits in Air % by Volume: Lower Limit 1.2 Upper Limit 8.0

Unusual Fire and Explosion Hazards:

Very volatile and extremely flammable. Vapors ignite at sources distant from handling point.

Extinguishing Media: Carbon dioxide, dry chemical, alcohol foam, water mist or fog.

Special Fire Fighting Procedures :

Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers. Keep fire-exposed containers cool with water spray.

REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: None

Appearance and Odor: Colorless liquid with an ammonia-like odor

Conditions to Avoid: Heat, sparks, open flame, open container, and poor ventilation.

Materials to Avoid: Strong oxidizing agents and strong acids.

Hazardous Decomposition Products: Incomplete combustion can generate carbon dioxide and nitrogen oxides.

HEALTH HAZARD DATA

Carcinogenic Data: Triethylamine is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Primary Routes of Entry: Triethylamine may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation:

May cause irritation to the respiratory tract with sneezing, coughing, burning sensation of throat, constricting sensation of the larynx, and difficulty in breathing.

Eye Contact:

Liquid and high vapor concentration can cause irritation and disturbance of vision. May also cause chemical burns of the cornea.

Skin Contact:

Vapor may cause skin irritation experienced as itching and local redness. Exposure to liquid may cause severe local redness with swelling and chemical burns with necrosis of the skin.

Ingestion:

May cause chemical burns of the mouth, throat, and esophagus. Signs and symptoms will include pain or discomfort in the mouth, throat, chest, and abdomen; nausea; vomiting; diarrhea; dizziness; drowsiness; faintness; weakness; collapse; and coma.

Effects of Overexposure: May cause low grade dermatitis and conjunctivitis.

Medical Condition Aggravated by Exposure: None currently known.

FIRST AID MEASURES

Inhalation:

Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse, administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact:

Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact:

Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion:

Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

PREVENTATIVE MEASURES

Ventilation:

Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory:

Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes:

Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin:

Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or rubber offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to Triethylamine may require additional protective equipment.

Storage:

Triethylamine should be protected from temperature extremes and direct sunlight. Proper storage of Triethylamine must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, Triethylamine should be stored in an acceptably protected and secure flammable liquid storage room.

Other:

Emergency eyewash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

ENVIRONMENTAL PROTECTION DATA

Spill Control:

Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements. CERCLA Reportable Quantity: 5,000 pounds.

Waste Disposal:

Dispose of Triethylamine as an EPA hazardous waste. Contact state environmental agency for listing of licensed hazardous waste disposal facilities and applicable

Material Safety Data Sheet

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MSDS**TRIMETHYLAMINE****0483**

PRODUCT INFORMATION

Chemical name(s) : TRIMETHYLAMINE

Chinese Name: 三甲<基>胺

Synonyms: Methanamine, N, N-dimethyl; TMA solution

CAS No: 75-50-3

Molecular Weight: 59.11

Chemical Formula: C₃H₉N

RISK SYMBOL



PHYSICAL DATA

Appearance: Clear, colorless liquid.

Boiling Point: 43°C (109°F)

Odor: Pungent odor.

Melting Point: 6°C (43°F) Freezes

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Solubility: Completely soluble in water.
Vapor Density (Air=1): 2.0
Specific Gravity: 0.93
Vapor Pressure (mm Hg): 340 @ 25°C (77°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire:

Flash point: 6°C (43°F)
Autoignition temperature: 190°C (374°F)
Flammable limits in air % by volume: LEL: 2.0; UEL: 11.6
Flammable Liquid

Explosion: Above the flash point, explosive vapor-air mixtures may be formed.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. Decomposed by mercury.

Hazardous Decomposition Products: Burning may produce carbon monoxide, carbon dioxide, nitrogen oxides.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Oxidizers may react explosively with mercury; may react with nitrosating agents such as sodium nitrite, to form N-Nitrosodimethylamine, an OSHA regulated carcinogen.

Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

Warning! Flammable liquid. Harmful if swallowed or inhaled. Causes severe eye irritation and skin irritation. Causes respiratory tract irritation.

Potential Health Effects

Inhalation:

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Vapors are irritating to the nose, throat, lungs, and may cause coughing, sneezing and shortness of breath. Prolonged exposure to high vapor concentrations may cause respiratory tract problems.

Ingestion: Harmful if swallowed. Corrosive nature of liquid causes tissue damage.

Skin Contact: Highly irritating to the skin. May cause frostbite, burns, and necrosis.

Eye Contact:

Vapors are irritating to the eyes. The liquid is highly irritating and may cause intense pain, severe corneal damage, and permanent corneal opacity.

Chronic Exposure: Chronic exposure may cause dermatitis, conjunctivitis, and lung problems.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL): 10 ppm (TWA), 15 ppm (STEL)

-ACGIH Threshold Limit Value (TLV): 5 ppm (TWA), 15 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn up to the maximum use concentration specified by the respirator supplier. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

Material Safety Data Sheet

City University of Hong Kong

MSDS**BENEDICT SOLUTION****0484**

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PRODUCT INFORMATION

Chemical name(s) : BENEDICT SOLUTION

Chinese Name: 本立德試劑

Synonyms: Sugar indicator

CAS No: Not applicable to mixtures.

Molecular Weight: Not applicable to mixtures.

Chemical Formula: Not applicable. (ca. 75% water)

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RISK SYMBOL=====**PHYSICAL DATA**

Appearance: Clear, blue liquid.

Boiling Point: No information found.

Odor: Characteristic odor.

Melting Point: No information found.

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Solubility: Miscible in water.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization: Will not occur.
Incompatibilities:
Acids, bases, reducing or oxidizing agents, phosphorous pentoxide, zinc, lithium, calcium hydroxide.
Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

Danger! May cause eye burns. Harmful if swallowed or inhaled. Causes irritation to skin and respiratory tract.

Potential Health Effects

Inhalation:

Inhalation of mist may be irritating to respiratory tract. Symptoms associated with overexposure to sodium carbonate may include coughing, labored breathing and sore throat.

Ingestion:

Symptoms associated with ingestion of this solution are not expected to be severe. Ingestion of sodium carbonate may be corrosive to the gastro-intestinal tract where symptoms may include abdominal pain, diarrhea and collapse.

Skin Contact: Solution can be an irritant to the skin.

Eye Contact:

Solution is irritating to the eyes. Contact with sodium carbonate may cause conjunctival edema and corrosion.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits: None established.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

For conditions of use where limited exposure to fumes is apparent, a half mask chemical cartridge respirator may be worn. For emergencies, use a self-contained breathing apparatus or supplied air.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

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Material Safety Data Sheet

City University of Hong Kong

MSDS**Sodium tetraborate; Di-Sodium****0485**

PRODUCT INFORMATION

Chemical Name and Synonyms: Sodium tetraborate; Di-Sodium tetraborate,hydrated; Borax; Sodium borate

Chinese Name: 四硼酸鈉

Chemical Family: Inorganic salt

Chemical Formula: $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10 \text{H}_2\text{O}$

Product Use: Laboratory reagent

CAS No.: 1303-96-4

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Odour and Appearance: White odourless crystals or powder

Odour Threshold (ppm): Not applicable

Vapour Pressure (mm Hg): ~ zero

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Vapour Density (Air = 1): Not applicable
Evaporation Rate: Not applicable
Boiling Point (°C): 320°C
Melting Point (°C): 75°C
pH: 9.0 to 9.5 (0.1M, aqueous, 20°C)
Specific Gravity: 1.73 @ 20C
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Non flammable. Will not burn.
Extinguishing Media: Use an extinguisher appropriate to the surrounding material which is burning.
Flash Point (Method Used): Not applicable
Autoignition Temperature: Not applicable
Upper Flammable Limit (% by volume): Not applicable
Lower Flammable Limit (% by volume): Not applicable
Hazardous Combustion Products: Boron oxides, toxic and irritating fumes.
Sensitivity to Impact: None
Sensitivity to Static discharge: None

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances:
Acids, strong oxidizing agents, alkaloidal and metallic salts, elemental zirconium.
Reactivity: Excessive heat causes decomposition. Efflorescent in dry air.
Hazardous Decomposition Products: Boron oxides

HEALTH HAZARD DATA

Toxicological Data:

LD₅₀: (oral, rat) 2,660 mg/kg
LDLO: (adult, human) 709 mg/kg
LC₅₀: Not available

Effects of Acute Exposure to Product:

Inhaled:

Harmful, may irritate nasal and respiratory passages on contact. High concentrations of dust may cause coughing, nosebleeds, shorness of breath. May be absorbed causing systemic effects and respiratory ill health.

In contact with skin: May cause irritation. Readily absorbed through skin.

In contact with eyes: May irritate.

Ingested:

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Toxic. May cause severe vomiting, diarrhea, shock. Ingestion of 5 to 10 g has caused death.

Effects of Chronic Exposure to Product:

Prolonged exposure by inhalation or skin absorption may cause gastrointestinal irritation with vomiting and diarrhea, kidney damage, vascular collapse, central nervous system depression, dermatitis.

Carcinogenicity: No information available

Teratogenicity: No information available

Reproductive Effects: No information available

Mutagenicity: No information available

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

Flush eyes with gently running water for ten to twenty (10 to 20) minutes, holding eyelids open during flushing. If irritation persists, get medical attention.

Skin:

Remove contaminated clothing. Wash affected areas with soap and water. If irritation persists, get medical advice.

Inhalation:

Move victim to fresh air. Give oxygen and get medical attention for any breathing difficulty.

Ingestion:

If victim is alert and not convulsing, give 1 to 2 glasses of water to dilute material. DO NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation recommended.

Respiratory Protection:

Dust mask. NIOSH/MSHA-approved air-purifying respirator for dusty conditions. Positive pressure full face-piece self-contained breathing apparatus for high or unknown concentrations, as in fire or spill conditions.

Eye Protection: Chemical safety goggles.

Skin Protection:

Rubber gloves. Other protective clothing, plastic apron, gloves, sleeves and boots as required to prevent contact.

Other Personal Protective Equipment:

An eyewash and safety shower should be nearby and ready for use.

Handling Procedures and Equipment:

Workers using this material must be thoroughly trained in its hazards and its safe use. Use the smallest amount possible for the purpose in an area with good ventilation. Follow routine safe handling procedures. Avoid generating dust. Avoid contact with skin, eyes and clothing.

Storage Requirements:

Store in suitable, labelled containers in a cool, dry, well-ventilated area, out of direct sunlight. Keep containers tightly closed.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Cleanup personnel must be thoroughly trained in the handling of hazardous substances, and must wear protective equipment and clothing sufficient to prevent inhalation of dust or fumes, and contact with skin and eyes. Mix with inert material. Avoid raising dust. Transfer carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BORON TRICHLORIDE****0486****PRODUCT INFORMATION**

CHEMICAL NAME: Boron Chloride

Chinese Name: 三氯化硼

COMMON NAMES/SYNONYMS: Trichloroborane

FORMULA: BCl_3

CAS: 10294-34-5

RISK SYMBOL**PHYSICAL DATA**

Physical state (gas, liquid, solid) : Gas

Vapor pressure at 70°F : 20.6 psia

Vapor density (Air = 1) : 4.03

Evaporation point : Not Available

Boiling point : -54.5°F(12.5°C)

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Freezing point : -161°F(-107°C)
pH : Not Available
Specific gravity : Not Available
Oil/water partition coefficient : Not Available
Solubility (H₂O) : Hydrolyzes
Odor threshold : Not Available
Odor and appearance : Colorless gas with pungent, irritating acidic odor

FIRE AND EXPLOSION DATA

Conditions of Flammability: Nonflammable
Flash point: None
Method: Not Applicable
Autoignition Temperature: None
LEL(%): None
UEL(%): None
Hazardous combustion products: HCl
Sensitivity to mechanical shock: None
Sensitivity to static discharge: None

FIRE AND EXPLOSION HAZARDS:

Nonflammable gas. Cylinder may rupture violently from pressure when involved in a fire situation.

EXTINGUISHING MEDIA:

Nonflammable gas. Use media appropriate for surrounding fire. Use water cautiously as boron trichloride reacts violently with water to produce hydrochloric and boric acid.

FIRE FIGHTING INSTRUCTIONS:

Firefighters should wear respiratory protection (SCBA) and full turnout or Bunker gear. Additional chemical protective clothing should be worn to prevent skin contact. Special personnel decontamination procedures may be required. Consult HAZMAT specialist. Continue to cool fire exposed cylinders until well after flames are extinguished.

REACTIVITY DATA

STABILITY: Stable.

INCOMPATIBLE MATERIALS:

Reacts vigorously with water, steam, or moist air to produce heat and toxic or corrosive fumes. Incompatible with hexafluoroisopropylidene amino lithium, nitrogen dioxide, grease, organic matter, and oxygen. Reacts vigorously with fat or grease, oxygen (on sparking), nitrogen peroxide, aniline, and phosphine.

HAZARDOUS DECOMPOSITION PRODUCTS:

Hydrolysis yields hydrochloric and boric acids. Thermal decomposition may produce toxic hydrogen chloride gas.

HAZARDOUS POLYMERIZATION: Will not occur.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW:

Colorless poison gas with acidic odor. Irritating and corrosive to the eyes, skin and respiratory system. Exposure to high concentrations may result in burns to mucous membranes. Inhalation into the deep lung may result in pulmonary edema and chemical pneumonitis. Nonflammable. Hydrolyzes into hydrochloric and boric acid in the presence of water or moisture. Contents under pressure. Use and store below 125°F.

Carcinogenicity: -- NTP: No IARC: No OSHA: No

EYE EFFECTS:

Eye contact will cause severe irritation, inflammation, and painful burns. Burns may result in lesions and blindness. PERSONS WITH POTENTIAL EXPOSURE TO BORON TRICHLORIDE SHOULD NOT WEAR CONTACT LENSES.

SKIN EFFECTS:

Low concentrations may cause "stinging" of the skin. Severe burns may result at higher concentrations. Inorganic acid-like burns and corrosive action will occur at high concentrations resulting in lesions and early necrosis.

INGESTION EFFECTS: None known. Ingestion is unlikely.

INHALATION EFFECTS:

Boron trichloride hydrolyzes very rapidly into hydrochloric acid and boric acid in the presence of moisture. Slight exposure results in irritation of the upper respiratory tract and cough. Higher concentrations may cause inflammation and congestion of the lungs. Inhalation into the deep lung may result in difficulty breathing, chest pain, chemical pneumonitis and fluid retention with swelling in the lungs (edema). May cause shock, coma, and death.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Irritant and corrosive properties may aggravate pre-existing eye, skin, and respiratory conditions.

FIRST AID MEASURES

EYES:

Flush contaminated eye(s) with copious amounts of water. Part eyelids with fingers to assure complete flushing. Continue flushing for a minimum of 30 minutes. Seek immediate medical attention.

SKIN:

Flush affected area with copious amounts of water while removing contaminated clothing. Seek immediate medical attention.

INGESTION: None normally required.

INHALATION:

Prompt medical attention is mandatory in all cases of overexposure to boron trichloride. Rescue personnel should be equipped with self contained breathing apparatus. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is essential. Unconscious persons should be moved to an uncontaminated area and given mouth-to-mouth resuscitation and supplemental oxygen. Keep victim warm and quiet. Treat for shock as indicated. Assure that mucus or vomited material does not

obstruct the airway by use of positional drainage. Delayed pulmonary edema may occur. Keep patient under medical observation for at least 24 hours.

PREVENTATIVE MEASURES

ENGINEERING CONTROLS:

Local exhaust ventilation used in combination with enclosed processes as necessary to control boron trichloride concentrations to at or below acceptable exposure limits.

EYE/FACE PROTECTION: Gas-tight safety goggles with full faceshield, or full-face respirator.

SKIN PROTECTION:

Protective gloves or fully encapsulated vapor protective clothing. (Compound specific information was unavailable, Teflon (R) and Responder (R) provide adequate protection for exposures to boron trifluoride greater than 8 hours.)

RESPIRATORY PROTECTION:

Positive pressure air line with full-face mask and escape bottle or self-contained breathing apparatus should be available for emergency use.

OTHER/GENERAL PROTECTION: Safety shoes, safety shower, eyewash "fountain".

Handling and Storage:

Any materials suitable for use with anhydrous hydrogen chloride may be used with boron trichloride. Keep equipment scrupulously dry.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a pressure reducing regulator when connecting cylinder to lower pressure piping or systems. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperatures where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

ENVIRONMENTAL PROTECTION DATA

Evacuate all personnel from affected area. Deny entry to unauthorized and unprotected individuals. Prevent entry into waterways and sewers. Appropriate protective equipment is essential to prevent exposure. Boron trichloride will react vigorously with water or steam to form toxic and corrosive fumes. Consult HAZMAT specialist, the appropriate emergency telephone number listed in Section 1 and your closest BOC location. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CASEIN****0487**

PRODUCT INFORMATION

Chemical name(s) : CASEIN

Chinese Name: 酪蛋白

Synonyms: Milk protein

CAS No: 9000-71-9

Molecular Weight: Not applicable.

Chemical Formula: Not applicable.

RISK SYMBOL

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PHYSICAL DATA

Appearance: White to off-white powder or granules.

Boiling Point: No information found.

Odor: Faint characteristic odor.

Melting Point: No information found.

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Solubility: Negligible (< 0.1%)
Vapor Density (Air=1): Not applicable.
Specific Gravity: 1.25
Vapor Pressure (mm Hg): Not applicable.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 10

FIRE AND EXPLOSION DATA

Fire:

As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Minimum ignition temperature, dust cloud: 460°C.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information:

Use protective clothing and breathing equipment appropriate for the surrounding fire.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: No information found.

Conditions to Avoid: Moisture.

HEALTH HAZARD DATA

Emergency Overview

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Potential Health Effects

Inhalation: No adverse health effects expected from inhalation.

Ingestion: Not expected to be a health hazard via ingestion.

Skin Contact: Not expected to be a health hazard from skin exposure.

Eye Contact: Not expected to be a health hazard.

Chronic Exposure: No adverse health effects expected.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Not expected to require first aid measures. If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact:

Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Not expected to require first aid measures. Wash thoroughly with running water. Get medical advice if irritation develops.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 15 mg/m₃ total dust, 5 mg/m₃ respirable fraction for nuisance dusts.
- ACGIH Threshold Limit Value (TLV):
10 mg/m₃ total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Chromium****0488**

PRODUCT INFORMATION

Chemical Name and Synonyms: Chromium; Chromium metal; Chrome

Chinese Name: 鉻

Chemical Family: Metals

Chemical Formula: Cr

Product Use: Laboratory reagent

CAS No.: 7440-47-3

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Odour and Appearance: Steel-grey, lustrous metal, lumps, granules, powder, or crystals, odourless.

Odour Threshold (ppm): Not applicable

Vapour Pressure (mm Hg): 1 mm @ 1616°C

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Vapour Density (Air = 1): Not applicable
Evaporation Rate: Not available
Boiling Point (°C): 2200°C
Melting Point (°C): 1890°C
pH: Not applicable
Specific Gravity: 7.2
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability: Not flammable. Moderately flammable as dust.
Extinguishing Media: Use any means suitable for surrounding fire.
Flash Point (Method Used): Not applicable
Autoignition Temperature: Not applicable
Upper Flammable Limit (% by volume): Not applicable
Lower Flammable Limit (% by volume): Not applicable
Hazardous Combustion Products: Not known
Sensitivity to Impact: None
Sensitivity to Static discharge: None

REACTIVITY DATA

Chemical Stability: Stable
Incompatibility with other substances:
Powdered chromium becomes incandescent in the presence of oxidizing agents. A heated mixture of chromium powder and carbon dioxide may be ignitable and explosive. Bulk metal may burn in the presence of carbon dioxide.
Reactivity: Avoid incompatible materials.
Hazardous Decomposition Products: None known

HEALTH HAZARD DATA

Toxicological Data:
LD50: (unr, rat) 27,500 mg/kg
LC50: Not available

Effects of Acute Exposure to Product:

Inhaled:

Chromium dust appears to have low toxicity. Practically insoluble and non-reactive in the body. May cause temporary, mild irritation of upper respiratory tract, with coughing. If the exposure occurs during cutting or welding, exposure to hazardous dusts and fumes of chromium compounds may occur.

In contact with skin: May cause mechanical irritation.

In contact with eyes: May cause mechanical irritation.

Ingested: Practically non-toxic by ingestion. May be slightly irritating to gastrointestinal tract.

Effects of Chronic Exposure to Product:

Prolonged or repeated exposure can cause damage to liver and kidneys, gastrointestinal tumours, blood effects, including Hodgkins disease.

Carcinogenicity:

Carcinogenic by RTECS criteria (RTECS No. GB4200000). Inadequate human evidence (IARC cancer review, /90)

Teratogenicity: No information available

Reproductive Effects: No information available

Mutagenicity: No information available

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

Immediately flush eyes with running water for at least fifteen (15) minutes, holding eyelids open during flushing. If irritation persists, repeat flushing and get medical attention.

Skin:

Remove contaminated clothing. Wash affected areas with soap and water. If irritation persists, obtain medical advice.

Inhalation:

Move victim to fresh air. Give oxygen for breathing difficulty. Give artificial respiration ONLY if breathing has stopped. Obtain medical advice immediately.

Ingestion:

If victim is alert and not convulsing, give 1 to 2 glasses of water or milk to dilute material. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust ventilation required.

Respiratory Protection:

Dust mask. Up to 2.5 mg/m³: NIOSH/MSHA approved dust/mist respirator. Up to 5 mg/m³: dust/mist respirator, except single use or quarter mask. Up to 12.5 mg/m³: powered air-purifying respirator. With dust and mist filter, or continuous-flow supplied-air respirator. Up to 25 mg/m³: full facepiece, -powered air-purifying respirator with high efficiency particulate filter. Up to 250 mg/m³: positive-pressure full facepiece, supplied-air respirator. For higher or unknown concentrations, or where fumes may be present, positive-pressure, full face-piece self-contained breathing apparatus.

Eye Protection: Chemical safety glasses

Skin Protection: Protective gloves. Coveralls, apron, boots, etc., as required to limit contact.

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures and Equipment:

Follow routine safe handling procedures. Use the smallest amount possible for the purpose. Avoid generating dust.

Storage Requirements:

Store in suitable, labelled containers, in a cool, dry, well-ventilated area. Keep containers tightly closed.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Transfer carefully into container and arrange removal by disposal company. Wear protective equipment and clothing sufficient to prevent inhalation and contact with skin, eyes, and clothing. Wash site of spillage thoroughly with water and detergent.

Material Safety Data Sheet

City University of Hong Kong

MSDS**CHLORINE****0489**

PRODUCT INFORMATION

Product: CHLORINE, GASEOUS DRY

Chinese Name: 氯

CAS# 007782-50-5

RISK SYMBOL



PHYSICAL DATA

APPEARANCE: Amber color; liquified gas under pressure; vaporizes to greenish - yellow gas.

ODOR: Pungent odor.

BOILING POINT: -29.3°F (-34°C)

VAP. PRESS: 82 psig @ 68°F, 20°C

VAP. DENSITY: 2.49 @ 32°F, 0°C

SOL. IN WATER: 0.73g/100g H₂O @ 20°C

SP. GRAVITY: 1.47 @ 32°F, 0°C; 53.2 psia

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FIRE AND EXPLOSION DATA

FLASH POINT: None
METHOD USED: Not applicable

FLAMMABLE LIMITS
LFL: Not applicable
UFL: Not applicable

EXTINGUISHING MEDIA:

Chlorine will react or cause reducing materials to burn without oxygen. Water is effective only as a cooling media to reduce the reaction rate, however, water should not be applied directly to the chlorine leak. Where practical attempts should be made to reduce the available reactants through the isolation of the reaction from the chemical supply. This should be attempted only by properly trained personnel using prescribed protective equipment.

FIRE & EXPLOSION HAZARDS:

May react to cause fire and/or explosion upon contact with many organic compounds, ammonia, hydrogen, or many metals, and with all metals, including steel, at elevated temperatures.

FIRE-FIGHTING EQUIPMENT:

A positive pressure self-contained breathing apparatus for respiratory protection and protective clothing.

REACTIVITY DATA

STABILITY: (CONDITIONS TO AVOID) Avoid proximity to flammable materials including chemicals.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID)

Many organic compounds, ammonia, hydrogen, moist or hot steel, and many metals. May react explosively with some organics under confinement.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

HAZARDOUS POLYMERIZATION: Will not occur.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

Amber liquified gas under pressure. Pungent odor. Causes severe eye burns. Causes severe skin burns. May be fatal if inhaled. Highly toxic to fish and/or other aquatic organisms.

POTENTIAL HEALTH EFFECTS (See Section 11 for toxicological data.)

EYE:

May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Vapors may cause severe eye irritation and corneal injury.

SKIN: Short single exposure may cause severe skin burns.

INGESTION: Ingestion is unlikely due to physical state.

INHALATION:

A single brief (minutes) inhalation exposure to easily attainable concentrations may cause serious adverse effects, even death. Excessive exposure may cause severe irritation to upper respiratory tract and lungs and may cause lung injury.

SYSTEMIC (OTHER TARGET ORGAN EFFECTS):

Human signs and symptoms may include respiratory effects. In animals, effects have been reported on the following organs: kidney, liver and lung. Observations in animals include respiratory effects. Excessive exposure to chlorine gas has been known to also cause erosion of tooth enamel.

CANCER INFORMATION: Did not cause cancer in long-term animal studies.

TERATOLOGY (BIRTH DEFECTS):

Limited data suggests that chlorine is not teratogenic but may be slightly embryotoxic when administered at high doses in drinking water to pregnant rats.

REPRODUCTIVE EFFECTS: In animal studies, has been shown not to interfere with reproduction.

FIRST AID MEASURES

EYES:

Immediate and continuous irrigation with flowing water for at least 30 minutes is imperative. Prompt medical consultation is essential.

SKIN:

Immediate continued and thorough washing in flowing water for 30 minutes is imperative while removing contaminated clothing. Prompt medical attention is essential.

INGESTION: No adverse effects anticipated by this route of exposure.

INHALATION:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

NOTE TO PHYSICIAN:

Excellent warning properties force rapid escape from chlorine gas; thus most inhalations are mild to moderate. If escape is not possible, exposure to high concentrations for a very short time can result in dyspnea, hemoptysis and cyanosis with later complications being tracheobronchopneumonitis and pulmonary edema. Oxygen, intermittent positive pressure breathing and aerosolized bronchodilators are of therapeutic value in the light to moderate inhalation. A severe inhalation should be hospitalized and treated as a respiratory emergency. Any chlorine inhalation in an individual with compromised pulmonary function (COPD) should be regarded as a severe inhalation and a respiratory emergency. If a burn is present, treat as any thermal burn, after decontamination. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

PREVENTATIVE MEASURES

ENGINEERING CONTROLS:

Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines. Lethal concentrations may exist in areas with poor ventilation.

EYE/FACE PROTECTION:

Wear full-face respirator to prevent contact with vapors. Eye wash fountain should be located in immediate work area.

SKIN PROTECTION:

Use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron, or full-body suit will depend on operation. Safety shower should be located in immediate work area. Remove contaminated clothing immediately and launder before reuse. Items which cannot be decontaminated, such as shoes, belts, and watchbands, should be removed and destroyed.

RESPIRATORY PROTECTION:

Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator.

EXPOSURE GUIDELINE (S):

Chlorine: ACGIH TLV and OSHA PEL are 0.5 ppm TWA, 1 ppm STEL. ACGIH classifies as A4. Pels are in accord with those recommended by OSHA, as in the 1989 revision of pels.

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ENVIRONMENTAL PROTECTION DATA
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PROTECT PEOPLE:

Clear non-emergency personnel from area. Avoid contact with eyes and skin. Do not apply water directly to leak. Use appropriate safety equipment. For additional information, refer to "Exposure Controls/Personal Protection", MSDS Section 8.

PROTECT THE ENVIRONMENT: Contain material to prevent contamination of soil, surface water or ground water.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Dinitrotoluene Mixture****0490**

PRODUCT INFORMATION

Chemical name(s) : DNT Mixture Dinitrotoluene Mixture

Chinese Name: 二硝基甲苯

CAS Number : 25321-14-6

Formula : $\text{CH}_3\text{C}_6\text{H}_3(\text{NO}_2)_2$

CAS Name : Benzene, methyl dinitro

RISK SYMBOL



PHYSICAL DATA

Vapor Pressure : <1 mm/Hg @ 100°C (212°F)

Vapor Density : 6.3 (Air = 1)

Evaporation Rate : <1 0

Solubility in Water : <1 WT% 22 C°(72°F)

Odor : Distinctive Nitro Aromat.

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Form : Solid/Molten
Color : Medium Yellow
Specific Gravity : 1.32 @ 57°C
pH Information: Not available
Appearance: Crystalline/Clear Oil
Boiling Point, 760 mmHg: Starts decomposing at 250°C (482°F)
Freezing Point: 56°C (133°F) dry basis

FIRE AND EXPLOSION DATA

Flammable Properties

Flash Point : 173°C (343°F)
Method : SFCC
Flammable limits in Air, % by Volume
LEL : *
UEL : *
Autoignition : * C
Autodecomposition : 270°C (518°F)

Fire and Explosion Hazards:

OSHA Class III B Combustible Material. Will burn. Fire or high temp., Above 270°C (518°F), and confined material will cause an explosion (see also Decomposition).

Extinguishing Media: Water, Dry Chemical. Carbon dioxide (CO₂)

Fire Fighting Instructions:

Evacuate personnel to a safe area. Flood with water. Cool tank/container with water spray.

Do not attempt to fight large or advanced fires; material will explode if confined and heated above 270 C. Fight smaller fires with unmanned or remotely activated equipment. Run-off from fire control may cause pollution.

REACTIVITY DATA

Incompatibility with Other Materials: Incompatible with strong oxidizers and caustics.

Polymerization: Polymerization will not occur.

Instability: Unstable above 250°C (482°F). Will explode if confined and heated above 270°C (518°F).

Decomposition:

May release hazardous Nitrogen Oxide (NO_x) gases. Solid DNT is more sensitive to decomposition than liquid DNT. Contamination by foreign material, especially gritty substances, may considerably lower the decomposition temperature and increase the sensitivity of DNT to decomposition and explosion.

HEALTH HAZARD DATA

Potential Health Effects:

Harmful if inhaled or absorbed through skin; causes cyanosis. Symptoms may be delayed. Causes irritation.

Inhalation 1-hour LC₅₀: >2.87 mg/l in rats
Skin absorption ALD: >1,000 mg/kg in rabbits
Oral LD₅₀: 177 mg/kg in rats

2,4-DNT is an eye and skin irritant. Toxic effects described in animals from short exposures include nonspecific effects such as reduced weight gain, methemoglobinemia and effects on the central nervous system, the reproductive system, and the bone marrow. In tests with laboratory animals, technical grade 2,4-DNT has carcinogenic activity. Tests for mutagenic activity in bacterial and mammalian cell cultures have been inconclusive, with positive results in some studies, and negative results in others. Tests in animals demonstrate no developmental activity. 2,4-DNT produce testicular degeneration and decreased spermatogenesis in rats, mice, and dogs. Reduction in male fertility occurs in dominant lethal studies in rats.

2,6-DNT is a skin irritant, is not an eye irritant, and is a skin sensitizer in tests with laboratory animals. Toxic effects described in animals from exposure include methemoglobinemia, decreased spermatogenesis, testicular atrophy, anemia, paralysis and tremors. Tests with 2,6-DNT in some animals demonstrate carcinogenic activity, while tests for mutagenic activity in bacterial and mammalian cell cultures have been inconclusive with positive results in some studies, and negative results in others.

Human health effects of overexposure may initially include: reduction of the blood's oxygen carrying capacity with cyanosis (bluish discoloration), weakness, or shortness of breath by methemoglobin formation; abnormal blood forming system function with anemia; red blood cell destruction; nonspecific discomfort, such as nausea, headache or weakness; temporary nervous system depression with anaesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness; temporary lung irritation effects with cough, discomfort, difficulty breathing, or shortness of breath; or joint pain. All isomers appear to be able to significantly permeate the skin. There are no reports of human sensitization. Individuals with preexisting diseases of the cardiovascular system or bone marrow may have increases susceptibility to the toxicity of excessive exposures.

FIRST AID MEASURES

In case of contact:

Immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse and destroy contaminated shoes.

If inhaled:

Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

If swallowed:

Induce vomiting immediately by giving two glasses of water and sticking finger down throat. Call a physician. Never give anything by mouth to an unconscious person.

Note to Physician:

Absorption of this product into the body leads to the formation of methemoglobin which, in sufficient concentration, causes cyanosis. In case of skin absorption, symptoms may be delayed. Since reversion of methemoglobin to hemoglobin occurs spontaneously after termination of exposure, moderate degrees of cyanosis need be treated only by supportive measures such as bed rest and oxygen inhalation. Thorough cleansing of the entire contaminated area of the body including scalp and nails is of utmost importance. If cyanosis is severe,

intravenous injection of methylene blue, 1 mg/kg body weight, may be of value. Cyanocobalamin (Vitamin B-12), 1 mg intramuscularly, will speed recovery. Intravenous fluids and blood transfusions may be indicated in very severe exposures.

PREVENTATIVE MEASURES

Engineering Controls

Use in a totally closed system. Ventilation should be provided to keep concentration below the exposure limits.

Personal Protective Equipment:

Eye/Face: Coverall chemical splash goggles. Safety glasses (side shields); full-length face shield.

Respirator : Air supplied respirator. Suitable respiratory protection & chem. proof suit w/hood.

Additional : Butyl rubber apron and footwear

Protective Gloves: Neoprene or butyl gauntlet- lined if handling hot material.

Handling (Personnel):

Do not breathe vapor or mist. Do not breathe dust. Do not get on skin. Do not get on clothing. Do not get in eyes.

Wash thoroughly after handling. Use only with adequate ventilation.

Storage:

Store in a well ventilated place. Keep away from heat, sparks, and flame. Keep drums upright and tightly closed.

ENVIRONMENTAL PROTECTION DATA

Safeguards (Personnel):

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures:

Evacuate area - admission should be limited to trained personnel wearing full protective equipment. If molten, dike, soak up with sand or other non-combustible absorbant and allow to freeze. Place solid material in a covered steel drum for disposal. Use non-sparking tools. Comply with Federal, State, and local regulations on reporting releases.

Material Safety Data Sheet

City University of Hong Kong

MSDS**OXALIC ACID****0491****PRODUCT INFORMATION**

CHEMICAL NAME: Oxalic Acid

Chinese Name: 草酸

SYNONYMS(S): Ethanedioic Acid, Dicarboxylic acid.

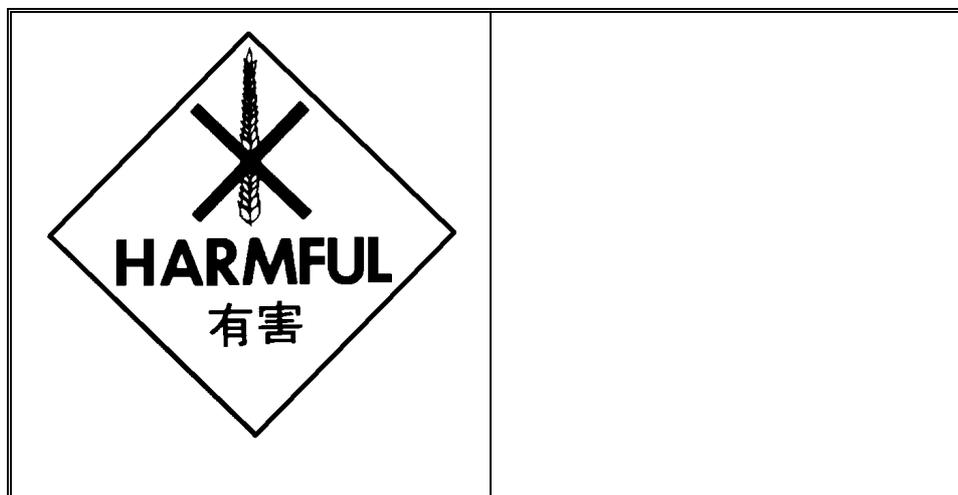
CHEMICAL FAMILY: Dicarboxylic acids

MOLECULAR FORMULA: $(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$

PRODUCT USE:

Metal cleaning, textile cleaning, anti-corrosion coating, chemical intermediate and catalyst.

CAS.: 144-62-7

RISK SYMBOL**PHYSICAL DATA**

PHYSICAL STATE: Solid.

ODOUR AND APPEARANCE: Odourless, colorless crystals.

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ODOUR THRESHOLD: Not applicable. Odourless.
SPECIFIC GRAVITY: 1.9 @ 17°C
VAPOR PRESSURE: 0.001mmHg @ 20°C
VAPOR DENSITY: 4.4 (air = 1)
% VOLATILES BY VOLUME: Not applicable.
BULK DENSITY: Not applicable.
EVAPORATION RATE: Not applicable.
SOLUBILITY IN WATER: 83.4 g/l
BOILING POINT: 149-160°C
MELTING POINT: 190°C
pH: 1.3 (.1 M solution in water).
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable.

FIRE AND EXPLOSION DATA

CONDITIONS OF FLAMMABILITY: Not applicable.
MEANS OF EXTINCTION: Water spray, dry chemical, alcohol foam or CO2
FLASH POINT AND METHOD OF DETERMINATION:
This material does not have a flash point but is readily ignited.

UPPER FLAMMABLE LIMIT: Not applicable.
LOWER FLAMMABLE LIMIT: Not applicable.
AUTO IGNITION TEMPERATURE: Not available.
SPECIAL FIRE FIGHTING PROCEDURES:
Wear complete face mask and self contained breathing apparatus. Use water to keep fire exposed containers cool.
Water may be used to flush spills away from fire.

FIRE AND EXPLOSION HAZARDS:
If molten, water or foam may cause frothing. In a fire oxalic acid breaks down into carbon monoxide, carbon dioxide and formic acid. Fumes may be highly toxic and irritating.

REACTIVITY DATA

STABILITY: Normally stable.
CONDITIONS CONTRIBUTING TO THE FOLLOWING INSTABILITY:
Heat or ultra-violet light contribute to instability. Sublimes at 150°C (melting point).
INCOMPATIBILITY:
Furfuryl alcohol, silver, alkalies, chlorites, oxidizing agents, iron and iron compounds.
HAZARDOUS REACTIONS/DECOMPOSITIONS:
In a fire oxalic acid breaks down into carbon monoxide, carbon dioxide, and formic acid. Fumes may be highly toxic and irritating.
HAZARDOUS POLYMERIZATION: Will not occur.

HEALTH HAZARD DATA

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INHALATION:

Oxalic acid can cause irritation of the nose and throat, and shortness of breath. When inhaled it is readily absorbed into the body and may cause headache and nausea.

EYE CONTACT:

Severe eye irritant. Can cause redness, pain and damage to the cornea. Prolonged exposure can cause irreversible eye damage.

SKIN CONTACT: Corrosive. Can cause skin irritation after prolonged exposure.

INGESTION:

Can cause severe poisoning or death depending on concentration and amount ingested. Can cause burns to the throat and stomach. A delayed effect of ingestion is kidney damage, possibly leading to renal failure.

CHRONIC EXPOSURE EFFECTS:

Chronic exposure to oxalic acid by ingestion, skin absorption and inhalation, is linked to stone formation in the kidney and urinary tract. Overexposure also leads to chronic respiratory tract irritation. Overexposure can also lead to ulcers of the skin, discoloration and possibly gangrene.

EXPOSURE LIMITS: (TLV-TWA) 1 mg/m³; Short term;(TLV-STEL) 2 mg/m³

IRRITANCY: Not available.

CARCINOGENICITY: Not available.

REPRODUCTIVE TOXICITY: Not available. **MUTAGENICITY:** Not available.

SENSITIZATION TO PRODUCT: Not available.

ANIMAL TOXICITY DATA: LD₅₀ (oral, rat) 375 mg/kg

NAME OF TOXICOLOGICALLY SYNERGISTIC PRODUCTS: Not available.

OTHER HEALTH EFFECTS:

Could effect the production of milk and bone growth in breastfeeding animals or animals in gestation.

FIRST AID MEASURES

INHALATION:

Remove from contaminated area to fresh air. If breathing has stopped begin artificial respiration. Obtain medical attention immediately.

EYE CONTACT:

Flush the contaminated eye(s) with lukewarm water for at least 20 minutes while holding eyelid(s) open. Obtain medical attention immediately.

SKIN CONTACT:

Remove contaminated clothing. Wash skin with water for at least 20 minutes. Obtain medical attention immediately.

INGESTION:

DO NOT induce vomiting. Give large quantities of water or milk. If vomiting occurs naturally readminister water or milk.

PREVENTATIVE MEASURES

RESPIRATORY PROTECTION:

If over TLV wear dust/mist respirator with chemical goggles. Alternatively, supplied air full facepiece respirator or air lined hood. Consult respirator supplier for limitations.

EYE/FACE PROTECTION:

Chemical safety goggles and/or full face shield. Contact lens should not be worn. Maintain eyewash fountain and quick drench facilities in work areas.

SKIN PROTECTION:

Wear impervious, protective clothing including boots, gloves, lab coat, apron or coveralls to prevent skin contact. Maintain a safety shower in the working area.

ENGINEERING CONTROLS:

Local exhaust ventilation preferred because emissions of contaminants can be controlled at source.

RESPIRATORY CONTROLS: Not applicable.

MATERIALS FOR PROTECTIVE CLOTHING: Natural rubber, neoprene, nitrile or polyethylene.

PRECAUTIONS:

Prepare emergency action plan in advance. Ensure workers are knowledgeable in the safe handling of this product.

STORAGE REQUIREMENTS:

Store sealed container in dry, well-ventilated area away from heat and incompatibles.

SPECIAL SHIPPING REQUIREMENTS: Not applicable.

ENVIRONMENTAL PROTECTION DATA

STEPS IN THE EVENT OF A SPILL OR LEAK:

Cover with soda ash or sodium bicarbonate to neutralize. Sweep into sealed container. Wear protective clothing. Prevent material from entering sewers or waterways. CLEANUP - Cover with soda ash or sodium bicarbonate to neutralize. Sweep into sealed container. Flush area with water.

WASTE DISPOSAL:

Dispose according to local, provincial and federal laws. DO NOT flush down sewer. Dissolve in a flammable solvent and burn or soak in paper and burn.

Material Safety Data Sheet

City University of Hong Kong

MSDS**FEHLING'S SOLUTION A****0492****PRODUCT INFORMATION**

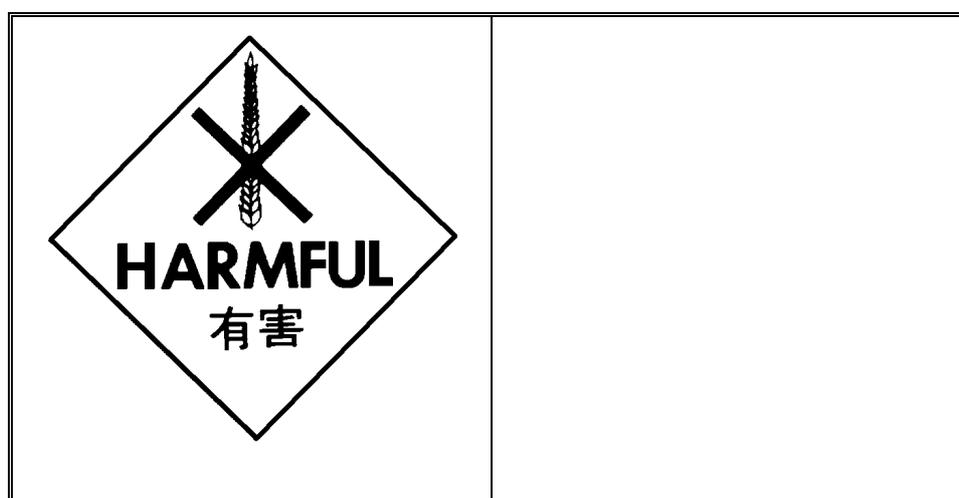
PRODUCT NAME(S) : FEHLING'S SOLUTION A

Chinese Name: 菲令氏溶液 A

Synonyms: Cupric sulfate (for reducing sugars); Cupric Tartrate TS, Alkaline

CAS No: 7758-98-7

Molecular Weight: 159.61

Chemical Formula: CuSO_4 in aqueous solution 4.43%.**RISK SYMBOL****PHYSICAL DATA**

Appearance: Clear, colorless to pale green solution.

Boiling Point: ca. 100°C (ca. 212°F)

Odor: Odorless.

Melting Point: ca. 0°C (ca. 32°F)

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Solubility: Infinitely soluble.
Vapor Density (Air=1): No information found.
Specific Gravity: ca. 1.04
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard. Solution can react with magnesium metal to release hydrogen gas.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: At temperatures > 400°C, decomposes to sulfur oxides and copper oxide.
Hazardous Polymerization: Will not occur.
Incompatibilities: Other metal solutions.
Conditions to Avoid: No information found.

HEALTH HAZARD DATA

Emergency Overview

Caution! May be harmful if swallowed. May cause irritation to skin, eyes, and respiratory tract. Affects the liver and kidneys.

Potential Health Effects

Inhalation:

Not expected to be a health hazard via inhalation, under normal conditions, but upon heating or misting the substance can cause irritation to the upper respiratory tract. Inhalation of mists of copper salts can cause ulceration of the nasal system.

Ingestion:

Large oral doses may cause systemic copper poisoning which may include nausea, vomiting, diarrhea, headache, kidney and liver damage, convulsions, coma, and death.

Skin Contact:

Symptoms are not expected to be as severe as higher concentrated solutions, where symptoms may include irritation and redness.

Eye Contact:

Splashes may cause irritation. Symptoms are not expected to be as severe as higher concentrated solutions, where symptoms may include conjunctivitis, ulceration, and clouding of the cornea.

Chronic Exposure: Prolonged or repeated skin exposure may cause dermatitis.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, impaired liver, kidney, or pulmonary function, glucose 6-phosphate-dehydrogenase deficiency, or pre-existing Wilson's disease may be more susceptible to the effects of this material.

FIRST AID MEASURES

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL): 1 mg/m³ (TWA) for copper dusts & mists as Cu

-ACGIH Threshold Limit Value (TLV): 1 mg/m³ (TWA) for copper dusts & mists as Cu

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**FEHLING'S SOLUTION B****0493**

PRODUCT INFORMATION

Chemical name(s) : FEHLING'S SOLUTION B

Chinese Name: 菲令氏溶液 B

Synonyms: Alkaline Tartrate (for reducing sugars); sodium hydroxide solution; Cupric Tartate TS, Alkaline

CAS No: Not applicable to mixtures.

Molecular Weight: Not applicable to mixtures.

Chemical Formula: Not applicable to mixtures.

RISK SYMBOL



PHYSICAL DATA

Appearance: Clear, colorless solution.

Boiling Point: 103°C (217°F)

Odor: Odorless.

Melting Point: -10°C (14°F)

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Solubility: Infinitely soluble.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
Volatiles by volume @ 21°C (70°F): No information found.

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Adding water to caustic solution generates large amounts of heat.

Special Information:
Use protective clothing and breathing equipment appropriate for the surrounding fire.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
May produce acrid smoke and irritating fumes when heated to decomposition.

Hazardous Polymerization: Will not occur.
Incompatibilities:
Acids, calcium or lead salts, silver nitrate, magnesium sulfate, aluminum, tin, zinc, chlorinated hydrocarbons, and acetone.

Conditions to Avoid: Heat, moisture, incompatibles.

HEALTH HAZARD DATA

Emergency Overview
Danger! Corrosive. Harmful if swallowed or inhaled. Causes burns to any area of contact.

Potential Health Effects
The health effects from exposure to diluted forms of sodium hydroxide are not well documented. They are expected to be less severe than those for concentrated forms which are referenced in the descriptions below.

Inhalation:

Severe irritant. Effects from inhalation of mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.

Ingestion:

Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appear days after exposure.

Skin Contact:

Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.

Eye Contact:

Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.

Chronic Exposure: Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Perform endoscopy in all cases of suspected sodium hydroxide ingestion. In cases of severe esophageal corrosion, the use of therapeutic doses of steroids should be considered. General supportive measures with continual monitoring of gas exchange, acid-base balance, electrolytes, and fluid intake are also required.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

Sodium hydroxide:

-OSHA Permissible Exposure Limit (PEL): 2 mg/m³ Ceiling

-ACGIH Threshold Limit Value (TLV): 2 mg/m³ Ceiling

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Protect from freezing. Do not store with aluminum or magnesium. Do not mix with acids or organic materials. Always add the caustic to water while stirring; never the reverse. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS**FLUORINE****0494****PRODUCT INFORMATION**

CHEMICAL NAME: Fluorine

Chinese Name: 氟

COMMON NAMES/SYNONYMS: Fluorine, Compressed

FORMULA: F₂

CAS: 7782-41-4

RISK SYMBOL**PHYSICAL DATA**

Physical state (gas, liquid, solid) : Gas

Vapor pressure : Gas, above crit. temp psia

Vapor density at STP (Air = 1) : 1.31

Evaporation point : Not Available

Boiling point : -306.6°F(-188.1°C)

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Freezing point : -363.5°F(-219.7°C)
pH : Not Available
Specific gravity : Not Available
Oil/water partition coefficient : Not Available
Solubility (H₂O) : Reacts violently
Odor threshold : Not Available
Odor and appearance : Pale yellow gas with choking ozone-like odor.

FIRE AND EXPLOSION DATA

Conditions of Flammability: Nonflammable, Oxidizer
Flash point: None
Method: Not Applicable
Autoignition Temperature: None
LEL(%): None UEL(%): None
Hazardous combustion products: Hydrogen Fluoride, Oxygen Difluoride
Sensitivity to mechanical shock: None
Sensitivity to static discharge: None
FIRE AND EXPLOSION HAZARDS:

Combustion products from a fire with fluorine as an oxidizer are generally extremely toxic and reactive. The products usually include hydrogen fluoride and oxygen difluoride. Cylinder may rupture violently from pressure when involved in a fire situation.

EXTINGUISHING MEDIA:

Stop the flow of gas. Fluorine reacts violently with many materials including extinguishing media.

FIRE FIGHTING INSTRUCTIONS:

Firefighters should wear respiratory protection (SCBA) and full turnout or Bunker gear. Additional chemical protective clothing should be worn as necessary to prevent skin contact. Special decontamination procedures may be required. Use water spray to cool intact containers to avoid explosion. Continue to cool fire-exposed cylinders until well after flames are extinguished.

REACTIVITY DATA

STABILITY:

Strong oxidizer. Reacts with every known element except helium, neon, and argon and most oxidizable materials.

INCOMPATIBLE MATERIALS:

Fluorine is the most powerful oxidizer known. It reacts with virtually all inorganic and organic substances, except some inert gases, perfluorinated hydrocarbons and some metals which have been "passivated". Reaction with combustibles can cause fire or explosion.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrofluoric acid and oxygen difluoride.

HAZARDOUS POLYMERIZATION: Will not occur.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
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EMERGENCY OVERVIEW

Pale yellow gas with choking odor. Corrosive poisonous gas. Will cause chemical burns to all tissues. Inhalation of vapors may result in pulmonary edema and chemical pneumonitis. Fluorine penetrates deeply into body tissues and will continue to exert toxic effects unless neutralized. Nonflammable. Strong oxidizer - will react violently with combustibles causing fire or explosion. Highly reactive - Reacts vigorously with most oxidizable materials at room temperature often with ignition. Reacts rapidly with water to produce hydrofluoric acid and ozone. Reacts violently and decomposes to hydrofluoric acid on contact with moisture. Contents under pressure. Use and store below 125°F.

EYE EFFECTS:

Corrosive and irritating to the eyes. Contact with the liquid or vapor causes painful burns and ulcerations. Burns to the eyes result in lesions and possible loss of vision.

SKIN EFFECTS:

Fluorine is corrosive and irritating to the skin and all living tissue. It hydrolyzes very rapidly yielding hydrofluoric acid so that skin burns are like that from exposure to acid. Toxic level exposure to dermal tissue causes hydrofluoric acid burns and skin lesions resulting in early necrosis and eventual scarring. Hydrofluoric acid burns exhibit severe pain, redness, possible swelling and early necrosis. Burns are progressive while any residual active fluoride remain.

INGESTION EFFECTS: Ingestion is unlikely as fluorine is a gas at room temperature.

INHALATION EFFECTS:

Corrosive and irritating to the upper and lower respiratory tracts. The irritation extends to the chest causing lacrimation, cough, labored breathing, excessive salivary and sputum formation. Excessive irritation to the lungs causes acute pneumonitis and pulmonary edema, which could be fatal. Chemical pneumonitis and pulmonary edema may result from exposure to the lower respiratory tract and deep lung. Residual pulmonary malfunction might also occur.

CHRONIC:

Extended low level systemic absorption of fluorine may cause fluorosis, an abnormal calcification pattern of the skeletal system.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

May aggravate pre-existing eye, skin, and lung disease.

FIRST AID MEASURES

EYES:

Persons with potential exposure should not wear contact lenses. Immediately flush contaminated eyes with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 30 minutes while seeking immediate medical attention.

SKIN:

Remove contaminated clothing while flushing affected area with copious quantities of water. Dermal burns may be treated with a calcium gluconate gel or slurry in water or glycerine. This compound binds the active fluorides in an insoluble form and limits burn extension and relieves pain. Magnesium oxide paste has also been used with some success. Seek immediate medical attention.

INGESTION: None required as ingestion is unlikely.

INHALATION:

Prompt medical attention is mandatory in all cases of overexposure. Rescue personnel should be equipped with full facepiece self-contained breathing apparatus. Conscious persons should be assisted to an area with fresh uncontaminated air. If breathing is difficult, administer oxygen. Unconscious victims should be moved to an area with fresh uncontaminated air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive. Keep victim warm and quiet. Assure that mucus or vomited material does not obstruct the airway by positional drainage. Delayed pulmonary edema may occur. Keep patient under medical supervision for at least 24 hours.

PREVENTATIVE MEASURES

ENGINEERING CONTROLS:

Hood with forced ventilation for small quantities. Use local exhaust ventilation and enclosed processes as necessary to control fluorine concentrations to at or below acceptable exposure guidelines. Mechanical (Gen.): In accordance with electrical codes.

EYE/FACE PROTECTION: Gas-tight safety goggles and face shield or full-face respirator.

SKIN PROTECTION:

Barricade(TM) and Responder(TM) gloves or fully encapsulated vapor protective clothing depending upon magnitude of exposure.

RESPIRATORY PROTECTION:

Positive pressure air line with full-face mask and escape bottle or self-contained breathing apparatus should be available for emergency use.

OTHER/GENERAL PROTECTION: Safety shoes, safety shower, eyewash "fountain"

Handling and Storage:

Most metals form a passive fluoride film with low pressure fluorine that protects the metals from further corrosion. The reaction with metals and fluorine is relatively slow at room temperature, but becomes vigorous and self-sustaining if the temperature is elevated. Monel (R) and nickel are preferred for higher temperature applications. Teflon (R) is the preferred gasket material.

Keep equipment scrupulously dry. Many of the metal fluorides are water soluble so that the passive film corrosion protection may be destroyed if wetted with water.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve protection outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<500 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full & empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "NO SMOKING OR OPEN FLAMES" signs in storage

and use areas. There should be no sources of ignition in areas where fluorine gas is used or stored. Fluorine reacts with many materials. Store separately. Outside or detached storage is preferred.

Process valves should be opened and closed with remote controlled extensions passing through a suitable barricade for additional protection. Double valving should be employed to facilitate the reduction in pressure from high pressure sources of fluorine.

Never store the compressed gas or liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

ENVIRONMENTAL PROTECTION DATA

Immediately extinguish all ignition sources and evacuate all personnel from affected area. Deny entry to unauthorized and unprotected individuals. Appropriate protective equipment is essential to prevent exposure. Fluorine is a powerful oxidizer - leaks may create a dangerous fire and explosion hazard. Consult a HAZMAT specialist and the appropriate emergency telephone number in Section 1 or your closest BOC location. Use water spray to cool intact containers to avoid an explosion. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Hexane****0495**

PRODUCT INFORMATION

CHEMICAL NAME: Hexane/Hexene

Chinese Name: 己烷

CAS NO.: Mixture - see below.

CHEMICAL FORMULA: C₆H₁₄/C₆H₁₂

CHEMICAL FAMILY: Mixture of paraffinic and olefinic Hydrocarbons

CHEMICAL NAME	CAS NO.
n-Hexane	110-54-3
1-Hexene	592-41-6
n-Butane	106-97-8
n-Octane	111-65-9

RISK SYMBOL



PHYSICAL DATA

City University of Hong Kong

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APPEARANCE/ODOR: Colorless liquid/mild, gasoline-like odor.
BOILING POINT: 69°C/156°F.
VAPOR PRESSURE: 12.8 psia @ 38°C/100°F.
SOLUBILITY IN WATER: Negligible.
SPECIFIC GRAVITY: Approx. 0.7

FIRE AND EXPLOSION DATA

FLASH POINT(METHOD): <-20°C/-4°F.
FLAMMABLE LIMITS: LEL: 1.1% UEL: 7.5%.
EXTINGUISHING MEDIA: Dry chemical, water spray (fog), foam or carbon dioxide.
HAZARDOUS THERMAL DECOMPOSITION PRODUCTS: Include oxides of carbon.
SPECIAL FIRE FIGHTING PROCEDURES: Avoid breathing smoke and vapor.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None known.

REACTIVITY DATA

STABILITY: Stable.
CONDITIONS TO AVOID: Exposure to heat, sparks, and open flame.
MATERIALS TO AVOID: Strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.

HEALTH HAZARD DATA

INHALATION:

Expected to be irritating to respiratory tract. Symptoms of overexposure to vapors include drowsiness, weakness, headache, dizziness and nausea.

EYE CONTACT: Expected to be an eye irritant.

SKIN CONTACT:

Expected to be a skin irritant. Repeated or prolonged skin contact may cause defatting and dermatitis. Symptoms of overexposure include nausea and dizziness.

INGESTION: Harmful if aspirated into the lungs-do not induce vomiting.

OTHER HEALTH EFFECTS:

This product contains butane. Literature data indicate that butane causes cardiac stimulation and arrhythmia (irregular heart beat) in the laboratory animal.

CHRONIC EFFECTS OF OVEREXPOSURE:

This product contains hexane. Literature data indicate that repeated or prolonged overexposure to vapors of hexane causes central nervous system effects in the laboratory animal and damages bone marrow.

FIRST AID MEASURES

INHALATION:

Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Get medical attention.

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

SKIN CONTACT: Flush skin with plenty of water. Get medical attention. Wash clothing before reuse.

INGESTION: If swallowed, give two glasses of water. Do not induce vomiting.

PREVENTATIVE MEASURES

EXPOSURE LIMITS: Not established by OSHA or ACGIH.

EYE PROTECTION: Chemical goggles.

PROTECTIVE GLOVES: Resistant to chemical penetration.

RESPIRATORY PROTECTION: NIOSH approved organic vapor respirator.

MECHANICAL VENTILATION: Recommended.

LOCAL EXHAUST VENTILATION: At source of vapor.

OTHER: If skin contact or contamination of clothing is likely, protective clothing should be worn.

STORAGE REQUIREMENTS:

Store in cool, dry, well-ventilated area away from sources of ignition. Keep containers closed when not in use.

ENVIRONMENTAL PROTECTION DATA

SPILLS OR LEAKS:

Ventilate area. Remove sources of ignition. Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Take up small spills with dry chemical absorbent. Large spills may be taken up with pump or vacuum and finished off with dry chemical absorbent. May require excavation of contaminated soil.

DISPOSAL METHODS:

Under the CERCLA/RCRA regulations currently in effect, this material is regulated as a hazardous waste or material. Therefore, it must be disposed of in a "permitted" hazardous waste facility in compliance with EPA and/or other applicable local, state, and federal regulations. It should be handled in a manner acceptable to good waste management practice.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Hydrazine****0496**

PRODUCT INFORMATION

CHEMICAL NAME : Hydrazine 35 %

Chinese Name: 聯氨

CHEMICAL FAMILY : Diamines

CHEMICAL NAME : Hydrazine

SYNONYMS : 54.7 % Hydrazine Hydrate; Aqueous Hydrazine Solution; Diamide Hydrate

FORMULA : $N_2H_4 \cdot H_2O$

CAS :302-01-2

RISK SYMBOL



PHYSICAL DATA

PHYSICAL FORM : Liquid

COLOR : Colorless to slightly yellow

ODOR : Ammonia like (fishy)

City University of Hong Kong

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ODOR THRESHOLD : 3 to 5 ppm
MOLECULAR WEIGHT : (For hydrazine hydrate) 50.06
pH : Greater than 12 @ 350 g/l water @ 68°F (20°C), original soln
BOILING POINT : Approx. 228.9°F (109.4°C)
MELTING/FREEZING POINT : Approx. -85°F (-65°C)
VISCOSITY : (Dynamic): Approx. 1.26 mPas @ 68°F (20°C)
SOLUBILITY IN WATER : Soluble
SPECIFIC GRAVITY : Approx. 1.021 @ 68°F (20°C)
BULK DENSITY : Not Established
% VOLATILE BY VOLUME : 100 %
VAPOR PRESSURE : 15 mbar @ 68°F (20°C)
VAPOR DENSITY : Approx. 1 (Air = 1)

FIRE AND EXPLOSION DATA

FLASH POINT : Greater than 212°F (100°C); DIN 51758 (PMCC).

FLAMMABLE LIMITS:

UPPER EXPLOSIVE LIMIT (UEL)(%): 83.4 % by volume in air at 1000 mbar

LOWER EXPLOSIVE LIMIT (LEL)(%): 9.3 % by volume in air at 1000 mbar

AUTO-IGNITION TEMPERATURE : Greater than 590°F (310°C).

EXTINGUISHING MEDIA : Dry Chemical; Foam; Carbon Dioxide; Water spray for large fires.

SPECIAL FIRE FIGHTING PROCEDURES:

Firefighters should wear full protective clothing including self-contained breathing apparatus Under fire conditions, hazardous vapors and gases may be emitted Containers exposed to excessive heat may rupture violently Use a water spray to keep containers cool Fight fires from a protected area.

REACTIVITY DATA

STABILITY : Stable at normal temperatures and pressures.

HAZARDOUS POLYMERIZATION : Will not occur.

INCOMPATIBILITIES :

Brisk or dangerous reactions with strong

oxidizers, catalytic metals (Lead, Copper, Zinc, Cadmium, Cobalt,

Molybdenum, Gold and Silver) and certain alloys (such as Bronze and Brass).

INSTABILITY CONDITIONS : Excessive temperatures (Also, see INCOMPATIBILITIES)

DECOMPOSITION TEMPERATURE: Refer to DECOMPOSITION PRODUCTS.

DECOMPOSITION PRODUCTS :

Under catalytic influence or elevated temperatures, H₂, NH₃ and N₂ and other toxic or flammable nitrogen compounds can be formed Slow reaction with oxygen from the air is possible at room temperature.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

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[WARNING] Toxic; Color: Colorless to slightly yellow; Form: Liquid; Odor: Ammonia like (fishy); May cause eye, skin, and respiratory tract irritation; Harmful if inhaled or ingested; May cause allergic skin reaction; May be fatal if absorbed through skin; May cause liver damage; May cause kidney damage; May affect nervous system; May cause lung damage; May cause blood disorders; May cause cancer based on animal data; Sudden reaction and fire may result when mixed with oxidizing agents; Use cold water spray to cool fire-exposed containers to minimize the risk of rupture; Toxic gases/fumes are given off during burning or thermal decomposition

POTENTIAL HEALTH EFFECTS:

ROUTE(S) OF ENTRY : Not Noted

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE:

ACUTE INHALATION :

In sufficient concentrations, hydrazine vapors will cause irritation to the upper respiratory tract Symptoms may include coughing, sore throat, dizziness and nausea.

CHRONIC INHALATION :

Repeated or prolonged inhalation of hydrazine may lead to liver and kidney damage, hemolysis (destruction) of red blood cells, and pneumonia.

ACUTE SKIN CONTACT :

Direct skin contact with this product may cause local irritation resulting in possible symptoms such as discomfort, itching, reddening and swelling Hydrazine can be absorbed through the skin Extensive skin contamination may result in fatal or near fatal consequences due to hepatic (liver) effects, central nervous system effects or other systemic effects.

CHRONIC SKIN CONTACT :

Prolonged or repeated skin contact may cause dermatitis (inflammation) in the form of erythema (reddening of the skin), blistering or eczema-like (dermatitis) rash Absorption of hydrazine may lead to liver and kidney damage and hemolysis of red blood cells Some individuals have exhibited allergic skin reactions which disappear when removed from exposure to hydrazine.

ACUTE EYE CONTACT :

Direct eye contact with hydrazine causes irritation Possible symptoms may include discomfort, reddening and tearing Severe eye exposure to hydrazine vapors has been reported to cause temporary blindness, lasting for as long as twenty-four (24) hours. Eye irritation may be delayed following exposure to hydrazine vapors.

ACUTE INGESTION :

Hydrazine is irritating to the mucous membranes Hydrazine is toxic by ingestion can result in fatal to near fatal consequences due to hepatic (liver) damage, central nervous system effects or other systemic effects.

CHRONIC INGESTION :

Repeated or prolonged absorption of hydrazine into the body may lead to liver and kidney damage and hemolysis of red blood cells.

OTHER EFFECTS OF EXPOSURE :

While hydrazine is known to be an animal carcinogen, no link has been established to cancer in humans In an epidemiology study of hydrazine manufacturing workers covering more than thirty (30) years has found no unusual excess of cancer (1)

CARCINOGENICITY:

NTP :

Hydrazine is listed as a Substance Reasonably Anticipated to be Carcinogenic in the National Toxicology Program (NTP) Seventh Annual Report on Carcinogens, 1994.

IARC :

Hydrazine is listed by the International Agency for Research on Cancer (IARC) as Group 2B, Possible Human Carcinogen; human evidence inadequate, animal evidence sufficient.

OSHA : Not regulated.

OTHER :

Based on the results of animal studies, the ACGIH has listed hydrazine in appendix A3, Confirmed Animal Carcinogen with Unknown Relevance to Humans in the ACGIH Threshold Limit Values for 1998.

MEDICAL CONDITIONS

AGGRAVATED BY EXPOSURE :

Persons with preexisting eye, skin or respiratory tract, or impaired liver and/or kidney function conditions may be more susceptible to the effects of this chemical.

FIRST AID MEASURES

FIRST AID FOR EYES :

Flush the eyes with large amounts of running water at room temperature for at least 15 minutes and see a physician, preferably an ophthalmologist, immediately.

FIRST AID FOR SKIN :

Wash immediately with cool, running water while removing contaminated clothing and shoes. Avoid using hot water and hard rubbing. Consult a physician, particularly if exposure is extensive, prolonged, or irritation persists after washing. Wash contaminated clothing thoroughly before reuse.

FIRST AID FOR INHALATION:

Persons acutely overexposed to hydrazine vapors should be removed from the contaminated environment as quickly as possible by properly protected rescue personnel. Trained persons can administer oxygen to ease breathing. Consult a physician immediately.

FIRST AID FOR INGESTION.:

Accidental ingestion of hydrazine solutions should be treated by taking large amounts of water. Never give anything by mouth to an unconscious person. Inducing vomiting is indicated in conscious patients, especially when there has been ingestion within the last thirty (30) minutes. A physician should be contacted immediately.

NOTE TO PHYSICIAN :

There are no definitive antidotes for hydrazine exposure. Physicians should treat exposed persons symptomatically. Overexposed persons should be closely observed for symptoms of central nervous system involvement, respiratory irritation, bronchitis or edema, and treat accordingly. Parenteral pyridoxine administration has been used by some physicians to treat patients suffering acute central nervous system effects. (In one reported case, following pyridoxine administration parenterally, there was a rapid reversal of coma in 4 hours in a patient who had been comatose for over 60 hours.)

PREVENTATIVE MEASURES

The above information is believed to be accurate to the best of our knowledge.
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EYE PROTECTION REQUIREMENTS : Splash goggles or full face shield.

SKIN PROTECTION REQUIREMENTS :

PVC, neoprene or nitrile splash suits, boots and gloves should be worn when spray or splash protection is required.

VENTILATION REQUIREMENTS :

Use local exhaust or other means to maintain airborne hydrazine concentration below the current Permissible Exposure Limit (0.1 ppm).

RESPIRATOR REQUIREMENTS :

Whenever the hydrazine levels exceed the current Permissible Exposure Limit (0.1 ppm), a positive pressure supplied air respirator is recommended.

ADDITIONAL PROTECTIVE MEASURES :

Safety showers and eyewash stations should be readily available Do not store or transfer hydrazine solutions in open containers Because hydrazine can be absorbed into the body by all common routes of exposure, protective equipment must be used Personal protective equipment is not an adequate substitute for safe work practices, proper equipment design and good maintenance practices.

STORAGE TEMPERATURE(MIN/MAX): Ambient/122°F (50°C).

SHELF LIFE : Unlimited in tightly closed containers.

SPECIAL SENSITIVITY : Extreme heat, oxidizing materials or catalytic metals.

HANDLING/STORAGE PRECAUTIONS:

When handling hydrazine, utilize protective clothing and equipment Do not get in eyes or on skin Do not breathe vapors or mists Wash thoroughly after handling Store in a dry place away from heat {below 122°F (50°C)} and away from ignition sources and oxidants, preferably outdoors Shelter drums stored outdoors from direct sunlight For indoor storage areas, continuous ventilation should be provided This product may become electrostatically charged during filling and transferring Make sure equipment is properly bonded and grounded. Store away from food and beverages.

ENVIRONMENTAL PROTECTION DATA

SPILL OR LEAK PROCEDURES :

Use appropriate protective equipment. Contain small spills by diking and digging a containment pit sufficiently large to hold at least 10 times the spill volume Dilute to approximately 10 times the volume with water Add sufficient dry commercial calcium hypochlorite (dry chlorine, HTHR, dry bleach) to completely oxidize the hydrazine Use 7-10 lbs per pound of hydrazine (1 lb of 35 % Hydrazine = 0.35 lbs N_2H_4) Calcium hypochlorite or other oxidizing agents should never be allowed to mix with undiluted hydrazine solutions The resulting reaction is very vigorous, releasing large amounts of heat and gas. Contaminated surfaces should be treated with household bleach or calcium hypochlorite solution to oxidize the residual hydrazine.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Hydrazine, Anhydrous****0497**

PRODUCT INFORMATION

Chemical name(s) : Hydrazine, Anhydrous

Chinese Name: 聯氨

Synonyms: Hydrazine; Diamide; Diamine

CAS No: 302-01-2

Molecular Weight: 32.05

Chemical Formula: NH_2NH_2

RISK SYMBOL



PHYSICAL DATA

Appearance: Colorless, oily, fuming liquid.

Boiling Point: 113.5°C (237°F)

Odor: Sharp ammoniacal or fishy-like amine odor.

Melting Point: 20°C (68°F)

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Solubility: Soluble in water.
Vapor Density (Air=1): 1.1
Specific Gravity: 1.0036 @ 25°C/4°C
Vapor Pressure (mm Hg): 14.4 @ 25°C (77°F)
pH: Strong base
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 100

FIRE AND EXPLOSION DATA

Fire:

Flash point: 38°C (100°F) CC
Flammable limits in air % by volume:
LEL: 2.9; UEL: 98
Autoignition Temperature varies with contact surface:
23°C (74°F) in contact with iron rust;
132°C (270°F) in contact with black iron;
156°C (313°F) in contact with stainless steel;
270°C (518°F) in contact with glass.

Flammable Liquid and Vapor!

Burns with violent flame. Thermally unstable. Ignites in air at room temperature on metal oxide surfaces, and in a wide variety of porous materials, such as wood, asbestos, earth, or cloth. Vapor is exceptionally hazardous - once ignited it will continue to burn by exothermic decomposition in complete absence of air or other oxidant.

Explosion:

Sealed containers may rupture when heated. Vapors can flow along surfaces to distant ignition source and flash back. Above the flash point, explosive vapor-air mixtures may be formed. Sensitive to static discharge.

Fire Extinguishing Media:

Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool. Use flooding quantities of water as fog or spray. Flooding may be necessary to prevent reignition.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability:

Stable at room temperature in closed containers packed under inert atmosphere, in the absence of UV radiation. Thermally unstable. Keep out of direct sunlight. Solution is alkaline. Prevent contamination.

Hazardous Decomposition Products: Burning may produce ammonia, nitrogen oxides.

Hazardous Polymerization: Will not occur.

Incompatibilities:

Powerful reducing agent; reacts vigorously with most oxidizing materials (including air). A strong alkali. Iron oxide can catalyze hydrazine vapor ignition with air as low as 74F. Incompatible with oxidizing agents, acids, wood, cloth. Contact of vapor with metal oxides (such as iron, copper, lead, molybdenum) can result in fire and possible explosion. Solutions attack glass, rubber, cork; stainless steels such as 316 should be used.

Conditions to Avoid:

Avoid direct light or sunlight, heat, sparks, flames, static discharge and other ignition sources, and incompatibles.

HEALTH HAZARD DATA

Emergency Overview :

Poison! Danger! Flammable liquid and vapor. Corrosive. Causes burns to any area of contact. May be fatal if swallowed, inhaled or absorbed through skin. May cause allergic skin reaction. Affects eyes, skin, respiratory system, central nervous system, liver, and kidney. Possible cancer hazard. May cause cancer based on animal data. Risk of cancer depends on duration and level of exposure.

Potential Health Effects

POISON. Very toxic by any route of exposure.

Inhalation:

Vapors will irritate or burn the mucous membranes and upper respiratory tract. Overexposure can produce severe health effects, including narcosis, pulmonary edema, weight loss, weakness, tremors, burning sensation, dizziness, nausea, convulsions, and sensitization. Hydrazine concentration considered to be immediately dangerous to life and health is 80 ppm.

Ingestion:

Poison. Swallowing will cause burns to the mouth and throat, gastrointestinal irritation, and may be fatal. Health effect may parallel those from inhalation.

Skin Contact:

Causes severe skin irritation and burns. Is a skin sensitizer. Absorption may occur with effects similar to inhalation overexposure.

Eye Contact:

Vapors cause severe eye irritation with swelling, burning, redness and discharge. Liquid contact can produce penetrating burns and possible permanent corneal opacity with visual impairment. Temporary blindness may occur with a severe exposure.

Chronic Exposure:

The liver is thought to be the primary target organ in hydrazine exposure. Other organs that may be affected include the kidneys, lungs, blood system and central nervous system. Carcinogenic potential based on animal test.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- For Hydrazine (CAS 302-01-2) -
- OSHA (PEL): 1 ppm (TWA), skin.
- ACGIH (TLV): 0.01 ppm (TWA), skin, A3 - animal carcinogen.
- NIOSH (REL): 0.03 ppm (2-hour), ceiling, potential occupational carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage:

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face,

forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Handle and store under nitrogen. Protect from direct sunlight. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Iodine and Potassium Iodine****0498**

PRODUCT INFORMATION

Chemical Name(s): Iodine and Potassium Iodine TS

Chinese Name: 碘液

Synonyms: Iodine and Potassium Iodine test solution

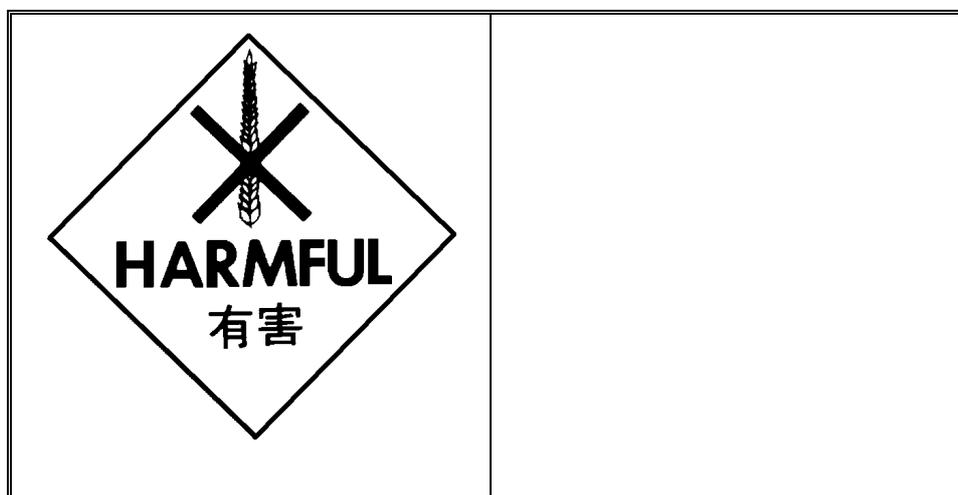
CAS No: Not applicable to mixtures.

Molecular Weight: Not applicable to mixtures.

Chemical Formula: Not applicable to mixtures.

Ingredient	CAS No	Percent	Hazardous
Iodine	7553-56-2	1 - 2%	Yes
Potassium Iodide	7681-11-0	5 - 6%	Yes
Water	7732-18-5	92 - 94%	No

RISK SYMBOL



PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Appearance: Transparent, reddish brown solution.
Boiling Point: No information found.
Odor: No information found.
Melting Point: No information found.
Solubility: No information found.
Vapor Density (Air=1): No information found.
Specific Gravity: No information found.
Vapor Pressure (mm Hg): No information found.
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21C (70F): No information found.

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage. May discolor on exposure to light.
Hazardous Decomposition Products: Burning may produce toxic iodine vapors.
Hazardous Polymerization: Will not occur.
Incompatibilities:
Ammonia, strong acids, powdered metals, alkali metals, acetaldehyde, acetylene, ammonium hydroxide, and strong reducing agents.
Conditions to Avoid: Heat, incompatibles.

HEALTH HAZARD DATA

Emergency Overview

Poison! Danger! Causes severe irritation or burns to every area of contact. May be fatal if swallowed or inhaled.
Vapors cause severe irritation to skin, eyes and respiratory tract. Affects the cardiovascular and central nervous systems. May cause allergic skin or respiratory reaction.

Potential Health Effects:

The following hazards are for concentrated solutions. Hazards of less concentrated solutions should be reduced.

Inhalation:

The above information is believed to be accurate to the best of our knowledge.
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Vapors severely irritate and can burn the mucous membranes and respiratory tract. Excessive tears, rhinitis, tightness in the chest, sore throat, headache and delayed pulmonary edema can result. Inhalation of concentrated vapors may be fatal.

Ingestion:

Can cause severe burns of the mouth, throat and stomach. Causes abdominal pain, diarrhea, fever, vomiting, stupor and shock. Probable lethal dose is 2 to 4 gm of free iodine.

Skin Contact:

Contact may cause blistering burns, irritation, and pain. Vapors may be severely irritating to the skin.

Eye Contact:

Vapors are severely irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure:

Chronic exposure to iodine may cause insomnia, conjunctivitis, inflammation of the nasal mucous, bronchitis, tremor, rapid heart beat, diarrhea and weight loss. Allergic sensitization may occur. Chronic iodine overdoses have produced iodism. Headache, fever, sneezing, salivation, and skin rashes may occur.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, eye problems, impaired respiratory function, or disease of the thyroid, lungs, or kidney may be more susceptible to the effects of the substance.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately. Observe for the development of pulmonary edema.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse. Iodine stains can be removed by immediately washing skin with 5% sodium thiosulfate solution.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 0.1 ppm Ceiling for iodine
- ACGIH Threshold Limit Value (TLV): 0.1 ppm Ceiling for iodine

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has unknown warning properties.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Store separately from reactive or combustible materials, and out of direct sunlight. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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ENVIRONMENTAL PROTECTION DATA
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Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. G., Vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

Material Safety Data Sheet

City University of Hong Kong

MSDS**Iron, metal****0499**

PRODUCT INFORMATION

Chemical Name and Synonyms: Iron, metal

Chinese Name: 鐵

Chemical Family: Metal

Chemical Formula: Fe

Product Use: Laboratory reagent

CAS No.7439-89-6

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Odour and Appearance: Fine grey filings, shavings or powder, odourless

Odour Threshold (ppm): Not applicable

Vapour Pressure (mm Hg): Not available

City University of Hong Kong

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Vapour Density (Air = 1): Not available
Evaporation Rate: Not available
Boiling Point (°C): 2750°C
Melting Point (°C): 1535°C
pH: Not available
Specific Gravity: 7.87
Coefficient of Water/Oil distribution: Not available

FIRE AND EXPLOSION DATA

Flammability:

Flammable solid. In powder form, can burn in air or react with oxidizers, and is capable of creating a dust explosion under certain conditions.

Extinguishing Media:

Dry chemical powder. DO NOT USE WATER. Firefighters must wear protective equipment and clothing sufficient to prevent inhalation of mists or fumes, and contact with skin, eyes, and clothing.

Flash Point (Method Used): Not available

Autoignition Temperature: Not available

Upper Flammable Limit (% by volume): Not available

Lower Flammable Limit (% by volume): Not available

Hazardous Combustion Products: Toxic iron oxide fumes

Sensitivity to Impact: None

Sensitivity to Static discharge: As dust, may be ignited by static discharge under certain conditions.

REACTIVITY DATA

Chemical Stability:

Stable to temperature of 700°C. Stable in dry air; readily oxidizes in moist air, forming rust. Ultrafine (5 microns) powder is very unstable and can ignite spontaneously in air.

Incompatibility with other substances:

Avoid acids, moisture, oxygen. Reacts violently with strong oxidizing agents, halogens, phosphorus, polystyrene. Reaction with water can produce flammable/explosive hydrogen gas.

Reactivity: Avoid incompatible materials. Moisture, generation of dust, ignition sources.

Hazardous Decomposition Products: Toxic iron oxide fumes.

HEALTH HAZARD DATA

Toxicological Data:

LD₅₀: (oral, rat) 30 g/kg

LC₅₀: Not available

Effects of Acute Exposure to Product:

Inhaled: Inhalation of dust is irritating and may be harmful.

In contact with skin: May irritate.

In contact with eyes: May cause mechanical irritation.

Ingested:

May be harmful. Severe overdose may have corrosive effect on gastrointestinal system, with necrosis, perforation and stricture. Symptoms of abdominal pain, nausea, vomiting, diarrhea may be delayed several hours. Metabolic acidosis may occur several days after an apparent recovery, and can lead to convulsions and coma.

Effects of Chronic Exposure to Product:

Long term inhalation can cause siderosis, a benign pneumoconiosis. Long-term exposure may cause effects to the liver, gastrointestinal system, blood and cardiovascular system.

Carcinogenicity:

Not listed as a human carcinogen. Tumorigenic by RTECS (4565500) criteria

Teratogenicity: No information available

Reproductive Effects: No information available

Mutagenicity: No information available

Synergistic Products: None known

FIRST AID MEASURES

Eyes:

Flush thoroughly with water for at least fifteen (15) minutes, holding eyelids open while flushing. Get medical advice if irritation develops.

Skin:

Remove contaminated clothing. Wash skin with plenty of water for at least fifteen (15) minutes. If irritation develops seek medical attention.

Inhalation:

Remove to fresh air. Give oxygen and get medical attention for any breathing difficulty.

Ingestion:

If victim is alert and not convulsing, rinse mouth thoroughly with water and give 2 to 4 glasses of water to drink. Do not induce vomiting. Seek medical attention.

PREVENTATIVE MEASURES

Engineering Controls: Local exhaust recommended

Respiratory Protection:

Dust mask. NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus for high or unknown exposures, or for fire or spill conditions.

Eye Protection: Chemical safety goggles.

Skin Protection: Rubber gloves. Other protective clothing as required to limit contact.

Other Personal Protective Equipment: Safety shower and eye-wash fountain in work area.

Handling Procedures and Equipment:

Flammable solid. Workers using this product should be thoroughly trained in its hazards and its safe use. Keep away from flames and other ignition sources. Use non-sparking tools. Follow routine safe handling procedures. Avoid generating dust.

Storage Requirements:

Moisture sensitive. Store in suitable, labelled containers, in a cool, dry, well-ventilated area, out of direct sunlight. Keep containers tightly closed when not in use and when empty. Protect from damage.

ENVIRONMENTAL PROTECTION DATA

Leak and Spill Procedure:

Eliminate all sources of ignition. Cleanup personnel should wear protective equipment and clothing sufficient to prevent inhalation of dust and particles and contact with skin, eyes and clothing. Mix with inert substance and transfer carefully into container for removal by disposal company. Wash site of spillage thoroughly with water and detergent. Use non-sparking tools.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Ferrous Chloride, 4-Hydrate****0500****PRODUCT INFORMATION**

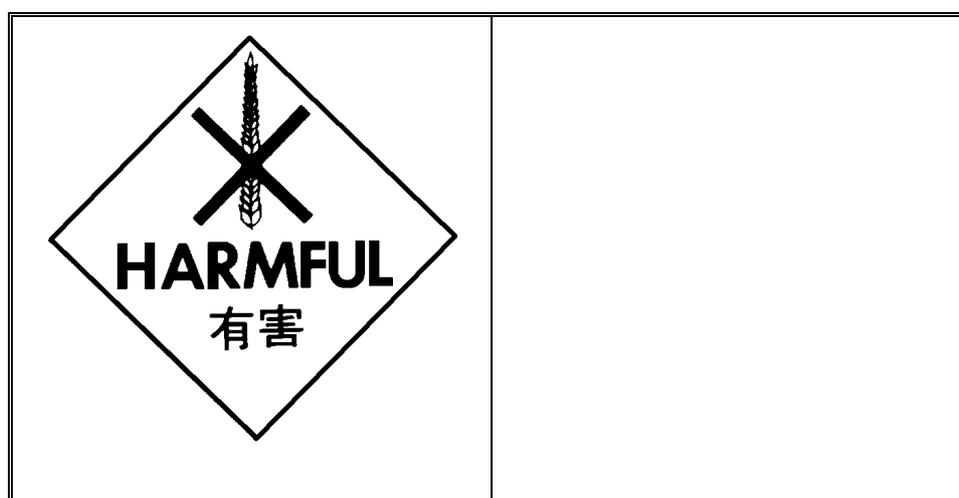
Chemical name(s) : Ferrous Chloride, 4-Hydrate

Chinese Name: 氯化亞鐵

Synonyms: Iron (II) Chloride, Tetrahydrate; Iron Chloride, Tetrahydrate

CAS No: 7758-94-3 (Anhydrous) 13478-10-9 (Tetrahydrate)

Molecular Weight: 198.81

Chemical Formula: $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$ **RISK SYMBOL****PHYSICAL DATA**

Appearance: Light green crystals.

Boiling Point: 1023°C (1873°F) (anhydrous)

Odor: Odorless.

Melting Point: 110°C (230°F) Loses two waters.

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Solubility: Appreciable (> 10%)
Vapor Density (Air=1): No information found.
Specific Gravity: 1.93
Vapor Pressure (mm Hg): 10 @ 700°C (1292°F)
pH: No information found.
Evaporation Rate (BuAc=1): No information found.
% Volatiles by volume @ 21°C (70°F): 0

FIRE AND EXPLOSION DATA

Fire: Not considered to be a fire hazard. Irritating hydrogen chloride fumes may form in fire.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Use water carefully as material will react with water to form acidic solution.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material.

REACTIVITY DATA

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
May produce hydrogen chloride. Material dissolves in water to form an acidic solution.

Hazardous Polymerization: Will not occur.
Incompatibilities: Ethylene oxide, potassium, sodium.
Conditions to Avoid: Incompatibles.

HEALTH HAZARD DATA

Emergency Overview
Danger! Corrosive. Causes severe irritation or burns to every area of contact. Harmful if swallowed or inhaled.
Affects the liver.

Potential Health Effects

Inhalation:

Corrosive. Extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Ingestion:

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Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach. Can cause sore throat, vomiting, diarrhea. Low systemic toxicity in small quantities but larger doses may cause systemic effects. Pink urine discoloration is a strong indicator of iron poisoning. Liver damage, coma and death may follow, sometimes delayed as long as three days.

Skin Contact: Corrosive. May cause severe irritation, redness, pain, and skin burns.

Eye Contact: Corrosive. Contact causes severe irritation, burns, redness, and pain.

Chronic Exposure:

Repeated ingestion may cause liver damage. Prolonged exposure of the eyes may cause discoloration.

Aggravation of Pre-existing Conditions: No information found.

FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PREVENTATIVE MEASURES

Airborne Exposure Limits:

-ACGIH Threshold Limit Value (TLV):
1 mg/m³ (TWA) soluble iron salt as Fe

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Material dissolves in water to form an acidic solution. Isolate from incompatible substances. Containers of this material are hazardous when empty since they retain product residues; observe all warnings for the product.

ENVIRONMENTAL PROTECTION DATA

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Material dissolves in water to form an acidic solution. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

Material Safety Data Sheet

City University of Hong Kong

MSDS

AMYLASE

0501

PRODUCT INFORMATION

NAME: AMYLASE REAGENT

Chinese Name: 澱粉®

CAS: NONE

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: LIQUID.

FIRE AND EXPLOSION DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Extinguishing Media: Water spray, carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

REACTIVITY DATA

Stability: STABLE.

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

May cause irritation.

Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

The toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Mechanical exhaust.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear protective equipment.

Absorb on sand or vermiculite and place in closed containers for disposal.

Ventilate area and wash spill site after material pickup is complete.

The above information is believed to be accurate to the best of our knowledge.
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Disposal Considerations :

Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state and local environmental regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS

BERYLLIUM POWDER

0502

PRODUCT INFORMATION

Name: BERYLLIUM POWDER

Chinese Name: 鈹

CAS: 7440-41-7

Molecular Formula: Be

Synonyms: Beryllium-9 * beryllium * glucinium * glucinum * RCRA waste number P015 *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: SILVER-GREY FLAKES

Specific Gravity: 1.850

FIRE AND EXPLOSION DATA

Extinguishing Media: Do not use carbon dioxide extinguisher on this material.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Alkali Metals

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

HEALTH HAZARD DATA

Acute Effects:

May be fatal if inhaled, swallowed, or absorbed through skin. Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.

Chronic Effects: CARCINOGEN.

Target organ(s): LUNGS

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

PREVENTATIVE MEASURES

Wash contaminated clothing before reuse.

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant

Gloves, safety goggles, other protective clothing.

Safety shower and eye bath.

Use only in a chemical fume hood.

Do not breathe dust.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Do not use if skin is cut or scratched. Wash thoroughly after handling.

Severe irritant.

Keep tightly closed.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.

Wear self-contained breathing apparatus, rubber boots and heavy

Rubber gloves.

Sweep up, place in a bag and hold for waste disposal.

Material Safety Data Sheet

City University of Hong Kong

MSDS

BIURET REAGENT

0503

PRODUCT INFORMATION

Name: Biuret Reagent
Chinese Name: 縮二脲[®]
CAS:None

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Liquid.

FIRE AND EXPLOSION DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Stability: Stable.

Incompatibilities: Strong oxidizing agents

Hazardous Combustion Or Decomposition Products: Toxic fumes of carbon monoxide, carbon dioxide

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

Vapor or mist is irritating to the eyes, mucous membranes and upper respiratory tract.

Causes skin irritation.

The toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

PREVENTATIVE MEASURES

Chemical safety goggles.

Compatible chemical-resistant gloves.

NIOSH/MSHA-approved respirator.

Safety shower and eye bath.

Mechanical exhaust required.

ENVIRONMENTAL PROTECTION DATA

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.
Cover with dry lime or soda ash, pick up, keep in a closed container and hold for waste disposal.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

CALCIUM HYPOCHLORITE

0504

PRODUCT INFORMATION

Name: Calcium Hypochlorite

Chinese Name: 次氯酸鈣

CAS #:none

Synonyms:

B-k powder * bleaching powder * calcium chlorohydrochlorite * calcium hypochlorite * calcium oxychloride * caporit * chemichlor g * chloride of lime * chlorinated lime * chlorolime chemical * hth * hth (bleaching agent) * hy-chlor * lime chloride * lo-bax * losantin * perchloron * pittchlor * pittcide * pittclor * sentry * solvox ks * t-eusol *

RISK SYMBOL



PHYSICAL DATA

Melting point: 100°C

Specific gravity: 2.35

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards:

Contact with other material may cause fire. Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong reducing agents strong acids

HEALTH HAZARD DATA

Acute Effects:

If swallowed calcium hypochlorite can produce nausea, vomiting, delirium, coma, respiratory collapse, holes in the esophagus and stomach. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Harmful if swallowed, inhaled, or absorbed through skin. High concentrations are extremely destructive to tissues of the mucous membranes and upper respiratory tract, eyes and skin.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. Assure adequate flushing of the eyes by separating the eyelids with fingers.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant

Gloves, safety goggles, other protective clothing.

Safety shower and eye bath.

Use only in a chemical fume hood.

Avoid breathing dust.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

The above information is believed to be accurate to the best of our knowledge.
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Wash thoroughly after handling.
Wash contaminated clothing before reuse.
Discard contaminated shoes.
Severe irritant.
Keep tightly closed.
Keep away from combustible materials, heat, sparks, and open flame.
Store in a cool dry place.
Avoid contact with acid.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy
Rubber gloves.
Cover with dry-lime, sand, or soda ash. Place in covered containers
Using non-sparking tools and transport outdoors.

Disposal Considerations:

Cautiously acidify a 3% solution or a suspension of the material to pH 2 with sulfuric acid. Gradually add a 50% excess of aqueous sodium bisulfite with stirring at room temperature. An increase in temperature indicates that a reaction is taking place. If no reaction is observed on the addition of about 10% of the sodium bisulfite solution initiate it by cautiously adding more acid. If manganese, chromium, or molybdenum are present adjust the pH of the solution to 7 and treat with sulfide to precipitate for burial as hazardous waste. Destroy excess sulfide, neutralize and flush the solution down the drain. Observe all federal, state and local environmental regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS

BUFFER TABLETS pH 7.0

0505

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PRODUCT INFORMATION

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Name: buffer tablets pH 7.0 package with 50 pieces
Chinese Name: 緩衝<劑>
CAS #:None

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RISK SYMBOL

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PHYSICAL DATA

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Appearance And Odor: Solid.

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FIRE AND EXPLOSION DATA

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Extinguishing Media:

Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong Acids

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

Causes eye and skin irritation.

Material is irritating to mucous membranes and upper respiratory tract.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

In case of contact, immediately wash skin with soap and copious amounts of water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant

Gloves, safety goggles, other protective clothing.

Safety shower and eye bath.

Mechanical exhaust required.

Do not breathe dust.

Avoid contact with eyes, skin and clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Irritant.

Keep tightly closed.

Hygroscopic
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves. Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**BUTYRALDEHYDE****0506**

PRODUCT INFORMATION

Name: Butyraldehyde

Chinese Name: 丁醛

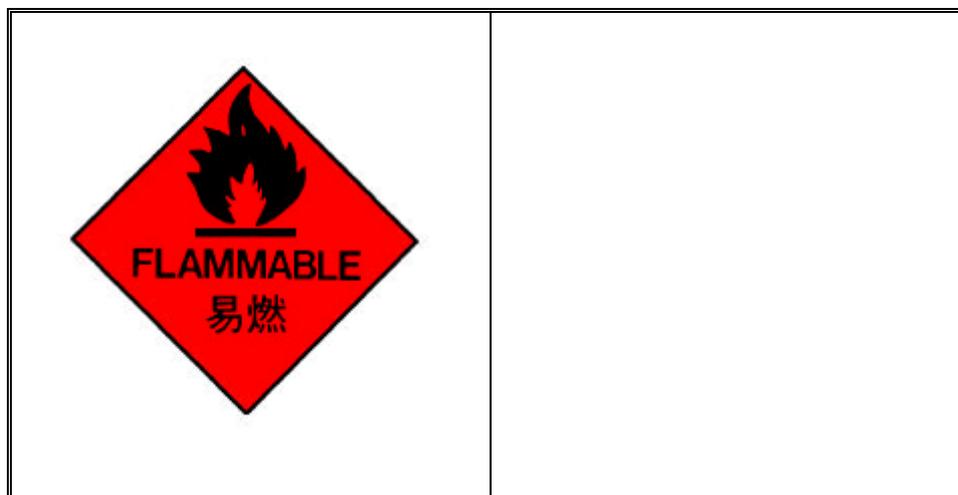
CAS #: 123-72-8

Molecular formula: C₄H₈O

Synonyms:

Aldehyde butyrique (French) * aldeide butirrica (Italian) * butal * butaldehyde * butalyde * butanal * n-butanal (Czech) * butanaldehyde * butyl aldehyde * n-butyl aldehyde * butyral * butyraldehyd (German) * n-butylaldehyde * butyric aldehyde * nci-c56291 *

RISK SYMBOL



PHYSICAL DATA

Boiling Point: 75°C

Melting Point: -96°C

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The above information is believed to be accurate to the best of our knowledge.
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Flashpoint 12°F (-11°C)
Explosion Limits In Air:
Upper 11.8 %
Lower 2 %
Vapor Pressure: 90 mmHg
Specific Gravity: 0.8 g
Vapor Density: 2.5 g/l

FIRE AND EXPLOSION DATA

Extinguishing Media:

Carbon dioxide, dry chemical powder or appropriate foam. Water may be effective for cooling, but may not effect extinguishment.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Use water spray to cool fire-exposed containers.

Unusual Fire And Explosions Hazards:

Extremely flammable. Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions. Forms explosive mixtures in air.

REACTIVITY DATA

Conditions To Avoid: Protect from light.

Incompatibilities: Oxidizing agents, strong bases, strong reducing agents, strong acids

Hazardous Combustion Or Decomposition Products: Carbon monoxide, carbon dioxide

Hazardous Polymerization: May undergo autopolymerization.

HEALTH HAZARD DATA

Acute Effects:

Harmful if swallowed, inhaled, or absorbed through skin.

Material is extremely destructive to tissue of the mucous membranes

And upper respiratory tract, eyes and skin.

Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant
Gloves, safety goggles, other protective clothing.
Use only in a chemical fume hood.
Safety shower and eye bath.
Use nonsparking tools.
Do not breathe vapor.
Do not get in eyes, on skin, on clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Remove and wash contaminated clothing promptly.
Keep tightly closed.
Keep away from heat, sparks, and open flame.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate Area:

Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Disposal Considerations:

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable.

Material Safety Data Sheet

City University of Hong Kong

MSDS

CALCIUM CARBIDE

0507

PRODUCT INFORMATION

Name: Calcium Carbide, Granulated

Chinese Name: 碳化鈣

CAS #: 75-20-7

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Solid.

FIRE AND EXPLOSION DATA

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Extinguishing Media:

Use approved class d extinguishers or smother with dry sand, dry ground limestone or dry clay. Do not use water.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Flammable solid.

Unusual Fire And Explosions Hazards:

This material, like most materials in powder form, is capable of creating a dust explosion. Emits toxic fumes under fire conditions. Reacts with water to liberate flammable and/or explosive gas.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents, acids, reacts violently with water.

Hazardous Combustion Or Decomposition Products: Carbon Monoxide, Carbon Dioxide

HEALTH HAZARD DATA

Acute Effects:

Harmful if swallowed, inhaled, or absorbed through skin.

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin.

Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

In case of contact, immediately wash skin with soap and copious amounts of water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Chemical safety goggles.

Compatible chemical-resistant gloves.

NIOSH/MSHA-approved respirator.

Safety shower and eye bath.

Use only in a chemical fume hood.

Avoid breathing dust.
Avoid contact with eyes, skin and clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Corrosive.
Keep tightly closed.
Keep away from heat, sparks, and open flame.
Do not allow contact with water.
Store in a cool dry place.

Handling And Storage:

Calcium carbide incandescens on contact: with lead difluoride at room temperature, on warming with hydrogen chloride, with chlorine at 245°C, with bromine at 350°C, with iodine at 305°C, with selenium on heating, with magnesium when heated in air. Reaction with methanol is vigorous but subject to an induction period of variable length. It ignites on heating with sulfur at 500°C. Reacts explosively with perchloryl fluoride at temperatures above 100°C. Forms explosive mixtures with sodium peroxide.

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ENVIRONMENTAL PROTECTION DATA
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Evacuate area.
Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

CANADA BALSAM

0508

PRODUCT INFORMATION

Name: Canada Balsam

Chinese Name: 加拿大香膠

CAS #: 8007-47-4

Synonyms: Balsam Of Fir * Canadian Balsam * Fir Balsam Absolute *

RISK SYMBOL

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PHYSICAL DATA

Melting Point: 93 - 98°C

Flashpoint 118°F(48°C)

Specific Gravity: 0,99

FIRE AND EXPLOSION DATA

Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Combustible liquid. Emits toxic fumes under fire conditions.

REACTIVITY DATA

Stability: Stable.

Incompatibilities: Sensitive to air, sensitive to moisture, strong oxidizing agents

Hazardous Combustion Or Decomposition Products: Carbon monoxide, carbon dioxide

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

May cause skin irritation.

May cause eye irritation.

Material may be irritating to mucous membranes and upper respiratory tract.

May be harmful by inhalation, ingestion, or skin absorption.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

In case of contact, immediately wash skin with soap and copious amounts of water.

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

PREVENTATIVE MEASURES

Safety shower and eye bath.

Mechanical exhaust required.

Wash contaminated clothing before reuse.

Wash thoroughly after handling.

Avoid breathing vapor.

Avoid contact with eyes, skin and clothing.

Avoid prolonged or repeated exposure.

The above information is believed to be accurate to the best of our knowledge.
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NIOSH/MSHA-approved respirator.
Compatible chemical-resistant gloves.
Chemical safety goggles.
Keep tightly closed.
Keep away from heat and open flame.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves. Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete. Evacuate area.

Material Safety Data Sheet

City University of Hong Kong

MSDS CERIUM(III) NITRATE HEXAHYDRATE 0509

PRODUCT INFORMATION

Name: Cerium(III) Nitrate Hexahydrate

Chinese Name: 硝(VI)酸鈰(III)

CAS #: 10294-41-4

Synonyms:

Cerium nitrate, hexahydrate * cerium trinitrate hexahydrate * cerous nitrate hexahydrate * nitric acid, cerium(3+) salt, hexahydrate *

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: Solid.

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FIRE AND EXPLOSION DATA

Extinguishing Media: Water spray.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Oxidizer.

Unusual Fire And Explosions Hazards:

Contact with other material may cause fire. Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong reducing agents, strong acids, protect from moisture.

Hazardous Combustion Or Decomposition Products: Nitrogen oxides

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

Causes severe eye irritation.

Causes skin irritation.

Material is irritating to mucous membranes and upper respiratory tract.

Target Organ(s): Blood, central nervous system

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant

Gloves, safety goggles, other protective clothing.

Use only in a chemical fume hood.

Safety shower and eye bath.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Do not breathe dust.
Do not get in eyes, on skin, on clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Keep tightly closed.
Keep away from combustible materials, heat, sparks, and open flame.
Store in a cool dry place.

Handling And Storage:

A mixture of aluminum powder, water and metal nitrate may explode due to a self-accelerating reaction. Mixtures of metal nitrates with alkyl esters may explode, owing to the formation of alkyl nitrates. Mixtures of a nitrate with phosphorous, tin (2) chloride or other reducing agents may react explosively. Mixtures of metal nitrates and phosphinates explode on heating. Mixtures containing nitrates, nitrites, and organic materials are potentially dangerous, especially in the presence of acidic materials and heavy metals. Incompatible with: cyanides, thiocyanates, isothiocyanates, hypophosphites.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Cover with dry lime or soda ash, pick up, keep in a closed container and hold for waste disposal.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**2-CHLOROBUTANE****0510**

PRODUCT INFORMATION

Name: 2-Chlorobutane

Chinese Name: 2-氯丁烷

CAS #: 78-86-4

Molecular formula: C₄H₉Cl

Synonyms: Sec-butyl chloride * 2-chlorobutane * 1-methylpropyl chloride *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Colorless liquid

Boiling Point: 67 To 69°C

Flashpoint 14°F (-10°C)

Specific Gravity: 0.872

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FIRE AND EXPLOSION DATA

Extinguishing Media:

Carbon dioxide, dry chemical powder or appropriate foam. Water may be effective for cooling, but may not effect extinguishment.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Use water spray to cool fire-exposed containers. Extremely flammable.

Unusual Fire And Explosions Hazards:

Vapor may travel considerable distance to source of ignition and flash back.

Container Explosion May Occur Under Fire Conditions.:

Forms explosive mixtures in air. Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents, strong bases

Hazardous Combustion Or Decomposition Products:

Toxic fumes of: carbon monoxide, carbon dioxide hydrogen chloride gas

HEALTH HAZARD DATA

Acute Effects:

Harmful if swallowed, inhaled, or absorbed through skin. May cause eye irritation. May cause skin irritation.

Chronic Effects: Possible carcinogen.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes. Flush skin with water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Chemical safety goggles.
NIOSH/MSHA-approved respirator.
Compatible chemical-resistant gloves.
Use only in a chemical fume hood.
Safety shower and eye bath.
Do not get in eyes, on skin, on clothing.
Do not breathe vapor.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Possible carcinogen.
Keep tightly closed.
Keep away from heat, sparks, and open flame.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Cover with an activated carbon adsorbent, take up and place in closed containers. Transport outdoors.
Use nonsparking tools.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**COPPER NITRATE****0511****PRODUCT INFORMATION**

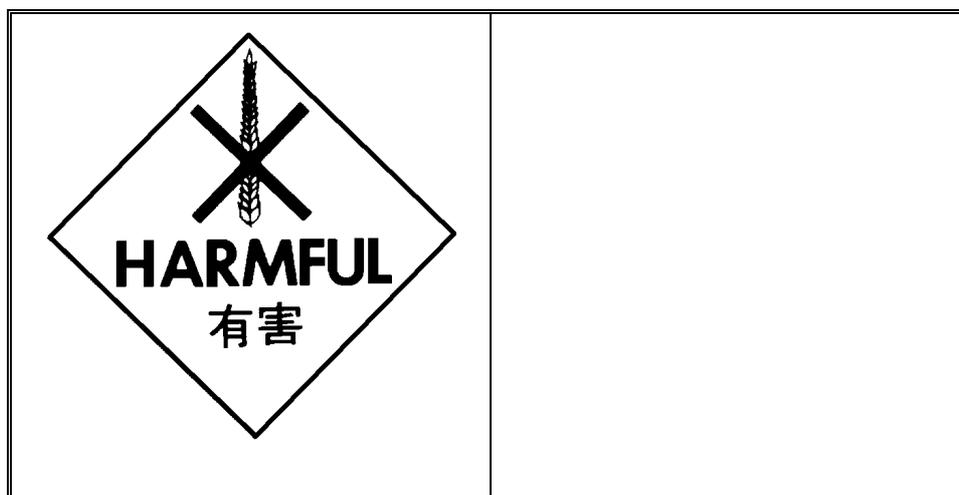
Name: Copper Nitrate

Chinese Name: 硝(V)酸銅(II)

CAS #: 10031-43-3

Synonyms:

Copper dinitrate trihydrate * copper nitrate trihydrate * copper (ii) nitrate trihydrate * cupric nitrate trihydrate * gerhardite * nitric acid, copper (2+) salt, trihydrate *

RISK SYMBOL**PHYSICAL DATA**

Appearance And Odor: Solid.

Melting Point: 114°C

Solubility:

Water -Soluble

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Ether -Soluble
Ethyl Acetate: Soluble
Dioxane: Soluble
Specific Gravity: 2.320

FIRE AND EXPLOSION DATA

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Oxidizer.

Unusual Fire And Explosions Hazards: May accelerate combustion.

Contact With Other Material May Cause Fire.: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Stability: Stable.

Incompatibilities:

Reducing agents, organic materials, finely powdered metals, heat, moisture

Hazardous Combustion Or Decomposition Products: Toxic fumes of: nitrogen oxides

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

Harmful if swallowed, inhaled, or absorbed through skin. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin.

Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Target Organ(S): Blood, kidneys, liver, central nervous system, vascular system

Additional Information:

Chronic copper poisoning is typified by hepatic cirrhosis, brain damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with wilson's disease. It has also been reported that copper poisoning has lead to hemolytic anemia and accelerates arteriosclerosis.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. Assure adequate flushing of the eyes by separating the eyelids with fingers.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately. Remove and wash contaminated clothing promptly.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant

Gloves, safety goggles, other protective clothing.

Use only in a chemical fume hood.

Faceshield (8-inch minimum).

Safety shower and eye bath.

Do not breathe dust.

Do not get in eyes, on skin, on clothing.

Wash thoroughly after handling.

Corrosive.

Harmful solid.

Keep tightly closed.

Do not store near, nor allow contact with, clothing and other

Combustible material.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Use nonsparking tools.

Sweep up, place in a bag and hold for waste disposal.

Avoid raising dust.

Ventilate area and wash spill site after material pickup is complete.

Disposal Considerations:

The material should be dissolved in 1) water; 2) acid solution or 3) oxidized to a water-soluble state. Precipitate the material as the sulfide, adjusting the pH of the solution to 7 to complete pre- cipitation. Filter the insolubles and dispose of them in a hazardous- waste site. Destroy any excess sulfide with sodium hypochlorite. Neutralize the solution before flushing down the drain. Observe all federal, state and local environmental regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS**COPPER(II) SULFIDE****0512****PRODUCT INFORMATION**

Name: Copper(II) Sulfide, Powder

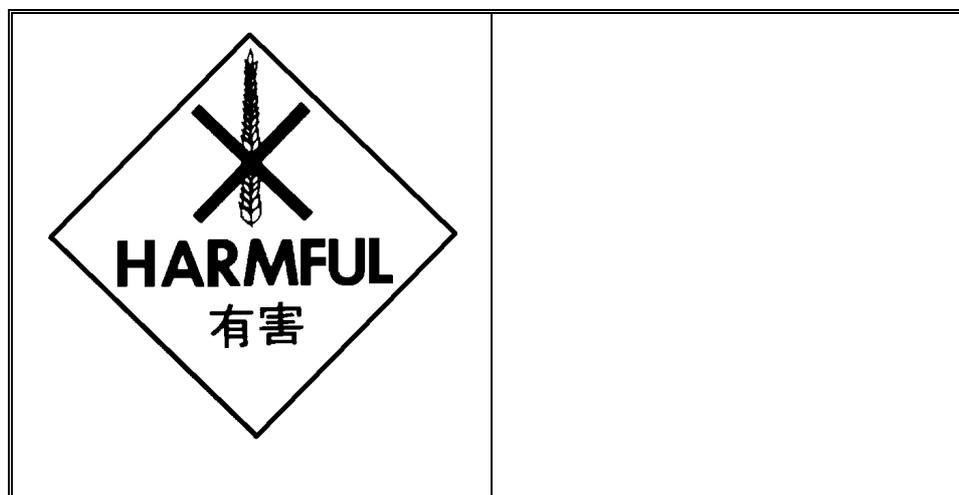
Chinese Name: 硫化銅(II)

CAS #: 1317-40-4

formula: CuS

Synonyms:

C.i. 77450 * c.i. pigment blue 34 * copper blue * copper monosulfide * copper(2+) sulfide * cupric sulfide * horace vernet's blue * monocopper monosulfide * oil blue *

RISK SYMBOL**PHYSICAL DATA**

Appearance And Odor: Dark blue or black powder

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No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Extinguishing Media:

Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Stability: Stable.

Conditions To Avoid: May decompose on exposure to moist air or water.

Incompatibilities: Strong oxidizing agents, strong acids

Hazardous Combustion Or Decomposition Products: Sulfur oxides, hydrogen sulfide gas

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

Chronic copper poisoning is typified by hepatic cirrhosis, brain damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with wilson's disease. It has also been reported that copper poisoning has lead to hemolytic anemia and accelerates arteriosclerosis.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

May cause skin irritation.

May cause eye irritation.

Material may be irritating to mucous membranes and upper respiratory tract.

May be harmful by inhalation, ingestion, or skin absorption.

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

In case of contact, immediately wash skin with soap and copious amounts of water.

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

PREVENTATIVE MEASURES

NIOSH/MSHA-approved respirator.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Compatible chemical-resistant gloves.
Chemical safety goggles.
Safety shower and eye bath.
Mechanical exhaust required.
Avoid inhalation.
Avoid contact with eyes, skin and clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Wash contaminated clothing before reuse.
Keep tightly closed.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.
Sweep up, place in a bag and hold for waste disposal.
Avoid raising dust.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

DIASTASE

0513

PRODUCT INFORMATION

Name: Diastase From Malt

Chinese Name: 澱粉<糖化>

CAS #: 9000-92-4

Synonyms:

Amylopol p * amzyme tx 8 * dabiase k-27 * diastase * glycogenase * jp- diastase * kleistase m 20 * kleistase tu 20
* malt diastase * maltin * mylase 100 * neospitase k * rapidase 2m * termozym * termoamylase *

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor:

Form - Solid

Color - White

Solubility: Water -Soluble

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No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.
Hazardous Polymerization: Will not occur. flammable.
Additional Information: Hygroscopic

REACTIVITY DATA

Data not available

HEALTH HAZARD DATA

Data not available

FIRST AID MEASURES

After contact with skin, wash immediately with plenty of soap and water.
In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. If necessary

PREVENTATIVE MEASURES

Chemical safety goggles.
Store at: 0-4
Store under argon.
Use only in well ventilated areas.

ENVIRONMENTAL PROTECTION DATA

Place in appropriate container.
Wash spill site with soap solution.
Flush spill area with copious amounts of water.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ARSENIC****0514**

PRODUCT INFORMATION

Name: Arsenic

Chinese Name: 砷

CAS #: 7440-38-2

Molecular formula: As

Synonyms:

Arsen (german, polish) * arsenic (ACGIN: OSHA) * arsenicals * arsenic black * arsenic-75 * colloidal arsenic * grey arsenic * metallic arsenic *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Grey chunks

Melting Point: 817°C

Specific Gravity: 5.727

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FIRE AND EXPLOSION DATA

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Air sensitive, heat, oxidizing agents

Hazardous Combustion Or Decomposition Products: Arsenic oxides

HEALTH HAZARD DATA

Acute Effects:

May be fatal if inhaled, swallowed, or absorbed through skin.

May cause irritation.

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer.

Chronic Effects: Carcinogen.

Target Organ (S): Skin, lungs

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

PREVENTATIVE MEASURES

Discard contaminated clothing and shoes.

Wash thoroughly after handling.

Use only in a chemical fume hood.

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant

Gloves, safety goggles, other protective clothing.

Avoid all contact.

Do not breathe dust.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Keep tightly closed.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Wear disposable coveralls and discard them after use.
Cover with dry lime or soda ash, pick up, keep in a closed container
And hold for waste disposal.
Avoid raising dust.

Material Safety Data Sheet

City University of Hong Kong

MSDS

ETHANOL DENATURATED

0515

PRODUCT INFORMATION

Name: Ethanol Denaturated With 4.8% Methanol

Chinese Name: 乙醇變性

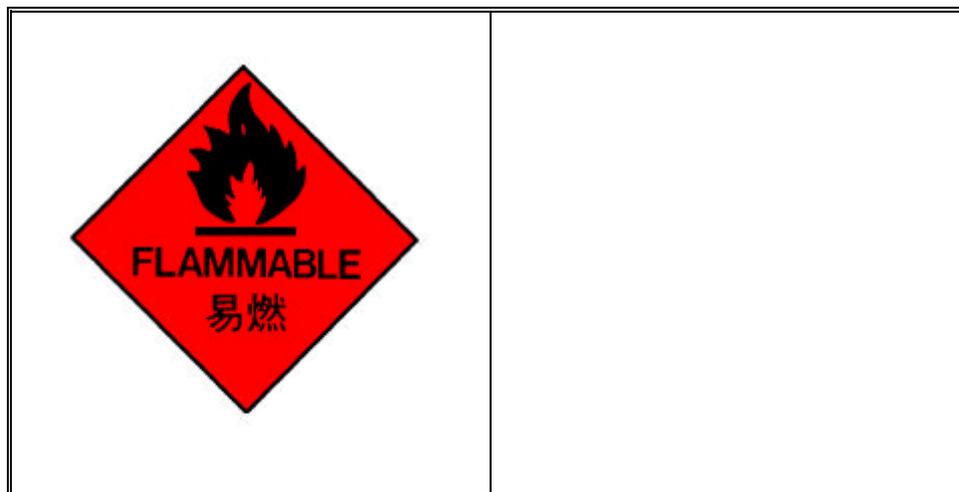
CAS #: 8013-52-3

Hazardous Ingredients: Contains methyl alcohol, chemical abstracts registry number 67-56-1.

Synonyms:

Absolute ethanol * aethanol (German) * aethylalkohol (German) * alcohol * alcohol, anhydrous * alcohol dehydrated * alcool ethylique (French) * alcool etilico (Italian) * algrain * alkohol (German) * alkoholu etylowego (polish) * anhydrol * cologne spirit * etanolo (Italian) * ethanol (ACGIN:OSHA) * ethyl alcohol (DOT:OSHA) * ethyl alcohol anhydrous * ethyl hydrate * ethyl hydroxide * etylowy alkohol (polish) * fermentation alcohol * grain alcohol * jaysol * jaysol s * methylcarbinol * molasses alcohol * nci-c03134 * potato alcohol * sd alcohol 23-hydrogen * spirits of wine * spirt * tecsol *

RISK SYMBOL



PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Appearance And Odor: Liquid.

FIRE AND EXPLOSION DATA

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Use water spray to cool fire-exposed containers. Flammable liquid.

Unusual Fire And Explosions Hazards:

Vapor may travel considerable distance to source of ignition and flash back.

REACTIVITY DATA

Stability: Stable.

Incompatibilities:

Oxidizing agents, peroxides, acids, acid chlorides, acid anhydrides, alkali metals, ammonia, moisture

Hazardous Combustion Or Decomposition Products:

Toxic fumes of: carbon monoxide, carbon dioxide

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

Harmful if inhaled.

Harmful if swallowed.

May be harmful if absorbed through the skin.

Causes skin irritation.

Vapor or mist is irritating to the eyes, mucous membranes and upper respiratory tract.

Can cause CNS depression.

Exposure can cause:

Gastrointestinal disturbances

Nausea, headache and vomiting

Narcotic effect

May cause convulsions.

Target organ(s): Eyes, kidneys, liver, nerves, heart

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. Assure adequate flushing of the eyes by separating the eyelids with fingers.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Mechanical exhaust required.

Safety shower and eye bath.

Do not breathe vapor.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Keep away from heat, sparks, and open flame.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Shut off all sources of ignition.

Evacuate area.

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Absorb on sand or vermiculite and place in closed containers for disposal.

Use nonsparking tools.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS D(+)-GLUCOSE MONOHYDRATE 0516

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PRODUCT INFORMATION

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NAME: D(+)-GLUCOSE MONOHYDRATE FOR MICROBIOLOGY*
Chinese Name: D(+)-葡萄糖
CAS #: 5996-10-1
Molecular formula: C₆H₁₂O₆.H₂O

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RISK SYMBOL

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PHYSICAL DATA

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Appearance And Odor: Solid.
Solubility: Water -Soluble , Ethanol -Soluble

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FIRE AND EXPLOSION DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong Oxidizing Agents

Hazardous Combustion Or Decomposition Products: Toxic fumes of: carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

May cause eye irritation.

May cause skin irritation.

Material may be irritating to mucous membranes and upper respiratory tract.

To the best of our knowledge, the chemical, physical, and

Toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

In case of contact, immediately wash skin with soap and copious amounts of water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Chemical safety goggles.

Compatible chemical-resistant gloves.

NIOSH/MSHA-approved respirator.

Safety shower and eye bath.

Mechanical exhaust required.

Avoid inhalation.

Avoid contact with eyes, skin and clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Keep tightly closed.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.

Sweep up, place in a bag and hold for waste disposal.

Avoid raising dust.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**HYDROGEN FLUORIDE****0517****PRODUCT INFORMATION**

Name: Hydrogen Fluoride

Chinese Name: 氫化氟

Molecular formula: HF

CAS #: 7664-39-3

Synonyms:

Acide fluorhydrique (French) * acido fluoridrico (Italian) * fluorowodór (polish) * fluorwasserstoff (German) * fluorwaterstof (Dutch) * hydrofluoride * hydrogen fluoride (ACGIH: OSHA) * RCRA waste number u134 * rubigine *

RISK SYMBOL**PHYSICAL DATA**

Appearance And Odor: Colorless liquid

Vapor pressure: 25mm 20°C

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Vapor density: 1.27

FIRE AND EXPLOSION DATA

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards:

Emits toxic fumes under fire conditions. Container explosion may occur under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong bases, avoid contact with metals, alkali metals

Hazardous Combustion Or Decomposition Products: Hydrogen fluoride

HEALTH HAZARD DATA

Acute Effects:

May be fatal if inhaled, swallowed, or absorbed through skin.

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin.

Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

To the best of our knowledge, the chemical, physical, and

Toxicological properties have not been thoroughly investigated.

Chronic Effects:

Target Organ(S): Liver, kidneys

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. Do not induce vomiting.

If person is conscious after ingestion of material, immediately give 4 to 8 ounces of milk or water. If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. Assure adequate flushing of the eyes by separating the eyelids with fingers.

Hydrofluoric (HF) acid burns require immediate and specialized first aid and medical treatment. Symptoms may be delayed up to 24 hours depending on the concentration of HF. After decontamination with water, further damage can occur due to penetration/absorption of the fluoride ion. Treatment should be directed toward binding the fluoride ion as well as the effects of exposure. Skin exposures can be treated with a 2.5% calcium gluconate gel repeated until burning ceases. More serious skin exposures may require subcutaneous calcium gluconate except for digital areas unless the physician is experienced in this technique, due to the potential for tissue injury from increased

pressure. Absorption can readily occur through the subungual areas and should be considered when undergoing decontamination. Prevention of absorption of the fluoride ion in cases of ingestion can be obtained by giving milk, chewable calcium carbonate tablets or milk of magnesia to conscious victims. Conditions such as hypocalcemia, hypomagnesemia and cardiac arrhythmias should be monitored for, since they can occur after exposure.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Use only in a chemical fume hood.

Safety shower and eye bath.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Wash contaminated clothing before reuse.

Discard contaminated shoes.

Poison

Corrosive.

Keep tightly closed.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Absorb on sand or vermiculite and place in closed containers for disposal.

Disposal Considerations:

Cautiously dissolve the material in water. Neutralize immediately with sodium carbonate, or first add a little hydrochloric acid followed by sodium carbonate if the material does not dissolve completely. Add calcium chloride in excess of the amount needed to precipitate the fluoride and/or carbonate. Separate the insolubles and bury in a landfill site approved for hazardous-waste disposal. Observe all federal, state and local environmental regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS**DL-LACTIC ACID****0518**

PRODUCT INFORMATION

Name: DL-Lactic Acid

Chinese Name: 乳酸

CAS #: 598-82-3

Molecular formula: C₃H₆O₃

Synonyms:

Ethylidenelactic acid * 1-hydroxyethanecarboxylic acid * 2- hydroxypropanoic acid * 2-hydroxypropionic acid * alpha- hydroxypropionic acid * kyselina 2-hydroxypropanova (czech) * kyselina mlecna (czech) * dl-lactic acid * milchsäure (German) * milk acid * ordinary lactic acid * propanoic acid, 2-hydroxy- * propel * propionic acid, 2-hydroxy- * racemic lactic acid * sy-83 *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Liquid.

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The above information is believed to be accurate to the best of our knowledge.
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Flashpoint: 235°F (113°C)

Specific Gravity: 1.209

FIRE AND EXPLOSION DATA

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam. Water spray.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

REACTIVITY DATA

Stability: Stable.

Incompatibilities: Bases, oxidizing agents, reducing agents

Hazardous Combustion Or Decomposition Products: Carbon monoxide, carbon dioxide

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

Causes burns.

Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.

Ingestion can cause immediate burning pain in the mouth, throat, abdomen; severe swelling of the larynx and skeletal paralysis affecting the ability to breathe, circulatory shock and convulsions. May be harmful by inhalation, ingestion, or skin absorption. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin.

Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

To the best of our knowledge, the chemical, physical, and

Toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

In case of contact, immediately wash skin with soap and copious amounts of water.

Contamination of the eyes should be treated by immediate and prolonged irrigation with copious amounts of water.

Assure adequate flushing of the eyes by separating the eyelids with fingers.

PREVENTATIVE MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Wash contaminated clothing before reuse.
Wash thoroughly after handling.
NIOSH/MSHA-approved respirator.
Rubber gloves.
Chemical safety goggles.
Safety shower and eye bath.
Use only in a chemical fume hood.
Avoid contact and inhalation.
Avoid prolonged or repeated exposure.
Keep tightly closed.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.
Absorb on sand or vermiculite and place in closed containers for disposal.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

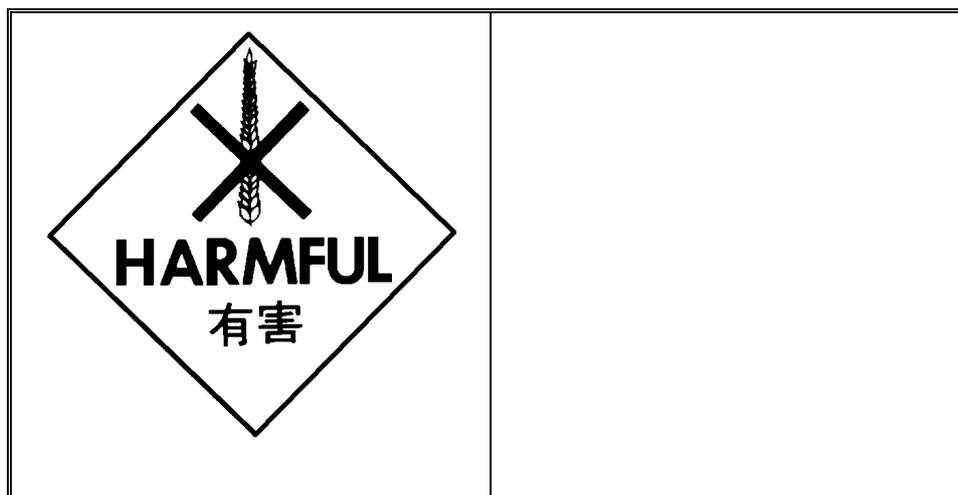
FERROUS SULFIDE

0519

PRODUCT INFORMATION

Name: Ferrous Sulfide
Chinese Name: 硫化亞鐵
CAS #: 1317-37-9
Molecular formula: FeS

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Black-grey chunks

FIRE AND EXPLOSION DATA

Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents, moisture sensitive, air sensitive, strong acids

Hazardous Combustion Or Decomposition Products: Sulfur oxides, hydrogen sulfide gas

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

May cause irritation.

To the best of our knowledge, the chemical, physical, and

Toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes. Flush skin with water.

If inhaled, remove to fresh air.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

PREVENTATIVE MEASURES

Chemical safety goggles.

Compatible chemical-resistant gloves.

Mechanical exhaust required.

Safety shower and eye bath.

Wear dust mask.

Avoid breathing dust.

Avoid contact with eyes, skin and clothing.

Wash thoroughly after handling.

Keep tightly closed.

Air and moisture sensitive

Store under nitrogen.

Store in a cool dry place.

Handling And Storage:

Moist material oxidizes exothermically in air reaching ignition temperature. Exothermic reaction with lithium initiates at 260°C and rapidly rises to 960°C.

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.

Sweep up, place in a bag and hold for waste disposal.

Avoid raising dust.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD(II) BROMIDE****0520****PRODUCT INFORMATION**

Name: Lead(II) Bromide
Chinese Name: 溴化鉛(II)
CAS #: 10031-22-8
Molecular formula: PbBr_2

RISK SYMBOL**PHYSICAL DATA**

Boiling Point: 892°C
Melting Point: 373°C
Specific Gravity: 6.66

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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FIRE AND EXPLOSION DATA

Extinguishing Media: Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents

Hazardous Combustion Or Decomposition Products: Hydrogen bromide gas, lead/lead oxides

HEALTH HAZARD DATA

Acute Effects:

May cause skin irritation.

May cause eye irritation.

Harmful if swallowed, inhaled, or absorbed through skin.

Lead salts have been reported to cross the placenta and to induce embryo- and feto- mortality. They also have teratogenic effect in some animal species. No teratogenic effects have been reported with exposure to organometallic lead compounds. Adverse effects of lead on human reproduction, embryonic and fetal development and postnatal (e.g., mental) development have been reported. Excessive exposure can affect blood, nervous and digestive systems. The synthesis of hemoglobin is inhibited and results in anemia. If left untreated, neuromuscular dysfunction, possible paralysis and encephalopathy can result. Additional symptoms of overexposure include: joint and muscle pain, weakness of the extensor muscles (frequently the hand and wrist), headache, dizziness, abdominal pain, diarrhea, constipation, nausea, vomiting, blue line on the gums, insomnia and metallic taste. High body levels produce increased cerebrospinal pressure, brain damage, stupor leading to coma and often death.

Chronic Effects:

May cause reproductive disorders.

Target Organ(S):

Blood, kidneys, nerves, female reproductive system, male reproductive system

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

In case of contact, immediately wash skin with soap and copious amounts of water.

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant
Gloves, safety goggles, other protective clothing.
Safety shower and eye bath.
Mechanical exhaust required.
Do not breathe dust.
Avoid contact with eyes, skin and clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Harmful dust.
Keep tightly closed.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.
Sweep up, place in a bag and hold for waste disposal.
Avoid raising dust.
Ventilate area and wash spill site after material pickup is complete.

Disposal Considerations:

The material should be dissolved in 1) water; 2) acid solution or 3) oxidized to a water-soluble state. Precipitate the material as the sulfide, adjusting the pH of the solution to 7 to complete precipitation. Filter the insolubles and dispose of them in a hazardous- waste site. Destroy any excess sulfide with sodium hypochlorite. Neutralize the solution before flushing down the drain. Observe all federal, state and local environmental regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD(II) IODIDE****0521****PRODUCT INFORMATION**

Name: Lead(II) Iodide
Chinese Name: 碘化鉛(II)
CAS #: 10101-63-0
Molecular formula: PbI_2

RISK SYMBOL**PHYSICAL DATA**

Boiling Point: 954°C
Melting Point: 402°C
Specific Gravity: 6.16

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Extinguishing Media: Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Conditions To Avoid: May discolor on exposure to light.

Incompatibilities: Strong oxidizing agents

Hazardous Combustion Or Decomposition Products: Hydrogen iodide, lead/lead oxides

HEALTH HAZARD DATA

Material may be irritating to mucous membranes and upper respiratory tract.

Harmful if swallowed, inhaled, or absorbed through skin. Causes eye and skin irritation.

May cause nervous system disturbances.

Anemia

Prolonged exposure to iodides may produce iodism in sensitive individuals. Symptoms of exposure include: skin rash, running nose, headache and irritation of the mucous membranes. For severe cases the skin may show pimples, boils, hives, blisters and black and blue spots. Iodides are readily diffused across the placenta. Neonatal deaths from respiratory distress secondary to goiter have been reported. Iodides have been known to cause drug-induced fevers, which are usually of short duration.

Lead salts have been reported to cross the placenta and to induce embryo- and feto- mortality. They also have teratogenic effect in some animal species. No teratogenic effects have been reported with exposure to organometallic lead compounds. Adverse effects of lead on human reproduction, embryonic and fetal development and postnatal (e.g., mental) development have been reported. Excessive exposure can affect blood, nervous and digestive systems. The synthesis of hemoglobin is inhibited and results in anemia. If left untreated, neuromuscular dysfunction, possible paralysis and encephalopathy can result. Additional symptoms of overexposure include: joint and muscle pain, weakness of the extensor muscles (frequently the hand and wrist), headache, dizziness, abdominal pain, diarrhea, constipation, nausea, vomiting, blue line on the gums, insomnia and metallic taste. High body levels produce increased cerebrospinal pressure, brain damage, stupor leading to coma and often death.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

Chronic Effects:

May cause congenital malformation in the fetus.

May cause reproductive disorders.

Target Organ(S): Thyroid, Nerves, Blood, Kidneys, Female reproductive system, Male reproductive system

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
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In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Safety shower and eye bath.

Mechanical exhaust required.

Do not breathe dust.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Harmful dust.

Irritant.

Possible sensitizer.

Keep tightly closed.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD(II) SULFIDE****0522**

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PRODUCT INFORMATION

Name: Lead(II) Sulfide

Chinese Name: 硫化鉛(II)

CAS #: 1314-87-0

Molecular formula: PbS

Synonyms: C.I. 77640 * galena * natural lead sulfide * plumbous sulfide *

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RISK SYMBOL

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PHYSICAL DATA

Specific Gravity: 7.5 g

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FIRE AND EXPLOSION DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Extinguishing Media: Dry chemical powder.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Hazardous Combustion Or Decomposition Products: Sulfur oxides, lead/lead oxides

HEALTH HAZARD DATA

Acute Effects:

Lead salts have been reported to cross the placenta and to induce embryo- and feto- mortality. They also have teratogenic effect in some animal species. No teratogenic effects have been reported with exposure to organometallic lead compounds. Adverse effects of lead on human reproduction, embryonic and fetal development and postnatal (e.g., mental) development have been reported. Excessive exposure can affect blood, nervous and digestive systems. The synthesis of hemoglobin is inhibited and results in anemia. If left untreated, neuromuscular dysfunction, possible paralysis and encephalopathy can result. Additional symptoms of overexposure include: joint and muscle pain, weakness of the extensor muscles (frequently the hand and wrist), headache, dizziness, abdominal pain, diarrhea, constipation, nausea, vomiting, blue line on the gums, insomnia and metallic taste. High body levels produce increased cerebrospinal pressure, brain damage, stupor leading to coma and often death. May be harmful by inhalation, ingestion, or skin absorption. May cause irritation.

Chronic Effects:

May cause reproductive disorders.

Target Organ(S): Blood, kidneys, nerves, female reproductive system, male reproductive system

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

Assure adequate flushing of the eyes by separating the eyelids with fingers.

PREVENTATIVE MEASURES

Wash contaminated clothing before reuse.

Discard contaminated shoes.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Wash thoroughly after handling.
Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant
Gloves, safety goggles, other protective clothing.
Faceshield (8-inch minimum).
Use only in a chemical fume hood.
Safety shower and eye bath.
Do not get in eyes, on skin, on clothing.
Avoid prolonged or repeated exposure.
Harmful solid.
Keep tightly closed.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Absorb on sand or vermiculite and place in closed containers for disposal.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**3-PENTANONE****0523**

PRODUCT INFORMATION

Name: 3-Pentanone

Chinese Name: 戊-3-酮

CAS #: 96-22-0

Molecular formula: C₅H₁₀O

Synonyms:

Dek * diethylcetone (French) * diethyl ketone (ACGIN) * dimethylacetone * metacetone * methacetone * pentanone-3 * propione *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Colorless liquid

Boiling Point: 102 To 103°C

Flashpoint : 55.4°F(13°C)

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Explosion Limits In Air:

Upper 7.7%

Lower 1.6% 25°C

Autoignition Temperature: 845°F (451°C)

Vapor Pressure: 28.1mm 20°C

Solubility:

Water -Soluble Ethanol -Slightly Soluble

Ether -Soluble Acetone -Slightly Soluble

Specific Gravity: 0.813

Vapor Density: 3

FIRE AND EXPLOSION DATA

Extinguishing Media:

Carbon dioxide, dry chemical powder or appropriate foam. Water may be effective for cooling, but may not effect extinguishment.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Flammable.

Use water spray to cool fire-exposed containers.

Unusual Fire And Explosions Hazards:

Vapor may travel considerable distance to source of ignition and flash back.

Container Explosion May Occur Under Fire Conditions.: Forms explosive mixtures in air.

REACTIVITY DATA

Incompatibilities: Oxidizing agents, strong bases, reducing agents

Hazardous Combustion Or Decomposition Products: Toxic fumes of: carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

Vapor or mist is irritating to the eyes, mucous membranes and upper respiratory tract.

Causes skin irritation.

Prolonged exposure can cause:

Nausea, dizziness and headache

Narcotic effect

Dermatitis

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.
If swallowed, wash out mouth with water provided person is conscious. Call a physician. Remove and wash contaminated clothing promptly.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.
Mechanical exhaust required.
Safety shower and eye bath.
Use nonsparking tools.
Do not breathe vapor.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Irritant.
Keep tightly closed.
Keep away from heat, sparks, and open flame.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Cover with an activated carbon adsorbent, take up and place in closed Containers. Transport outdoors.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**POTASSIUM****0524**

PRODUCT INFORMATION

Name: Potassium, Chunks, In Mineral Oil, 98%

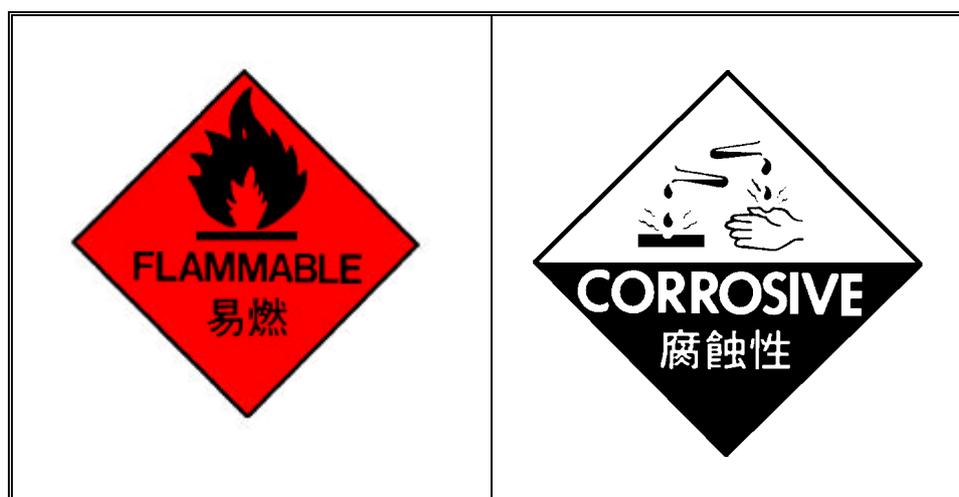
Chinese Name: 鉀

CAS #: 7440-09-7

Molecular formula: K

Additional Information: Contains mineral oil, chemical abstracts registry number 8012-95-1.

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Grey-black sticks

Melting Point: 64°C

Vapor Pressure: 0.09mm 260°C

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Extinguishing Media:

Use approved class d extinguishers or smother with dry sand, dry ground limestone or dry clay. Do not use water. Do not use carbon dioxide extinguisher on this material.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Flammable solid.

Unusual Fire And Explosions Hazards:

Material readily reacts with water generating flammable and/or explosive hydrogen gas.

Emits Toxic Fumes Under Fire Conditions.: Catches fire if exposed to air.

REACTIVITY DATA

Incompatibilities: Oxidizing agents, Teflon, chlorinated solvents, carbon monoxide, carbon dioxide,

Reacts Violently With: Water, acids, air sensitive

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

HEALTH HAZARD DATA

Acute Effects:

Harmful if inhaled or swallowed.

Causes burns.

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

Assure adequate flushing of the eyes by separating the eyelids with fingers.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately. Discard contaminated clothing and shoes.

PREVENTATIVE MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

NIOSH/MSHA-approved respirator.
Chemical safety goggles.
Wear heavy rubber gloves.
Rubber apron.
Faceshield (8-inch minimum).
Use nonsparking tools.
Use only in a chemical fume hood.
Avoid contact and inhalation.
Wash thoroughly after handling.
Corrosive.
Keep away from combustible materials, heat, sparks, and open flame.
Reacts violently with water.
Container should be opened only by a technically qualified person.

Handling And Storage:

Potassium readily forms hazardous oxides at room temperature even under oil, storage should be under argon or oxygen free solvents (kerosene or toluene) once the material has been opened. Do not attempt to cut the material if the surface is other than silver or black in appearance because a potentially explosive condition could exist.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

SILICON POWDER

0525

PRODUCT INFORMATION

Name: Silicon Powder

Chinese Name: 矽, 矽

CAS #: 7440-21-3

Synonyms: Defoamer s-10 * polyeristalline silicon powder * silicon (ACGIN:OSHA) *

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: Grey powder

Specific gravity: 2.330

FIRE AND EXPLOSION DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Extinguishing Media: Dry chemical powder. Do not use water.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards:

This material, like most materials in powder form, is capable of creating a dust explosion. Flammable solid. Emits toxic fumes under fire conditions.

REACTIVITY DATA

Stability: Stable.

Incompatibilities:

Reacts Violently With:

Alkali carbonates, oxidizing agents, (aluminum and lead azide), calcium, cesium chloride, cobalt difluoride, elemental fluorine, iodine pentafluoride, manganese trifluoride, rubidium chloride, fluorine nitrate, silver fluoride, and sodium-potassium alloy. Material readily reacts with water generating flammable and/or explosive hydrogen gas.

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

Material is irritating to mucous membranes and upper respiratory tract.

May be harmful by inhalation, ingestion, or skin absorption.

Causes eye and skin irritation.

To the best of our knowledge, the chemical, physical, and

Toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

In case of contact, immediately wash skin with soap and copious amounts of water.

Contamination of the eyes should be treated by immediate and prolonged irrigation with copious amounts of water.

PREVENTATIVE MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

NIOSH/MSHA-approved respirator.
Compatible chemical-resistant gloves.
Chemical safety goggles.
Safety shower and eye bath.
Mechanical exhaust required.
Use nonsparking tools.
Avoid breathing dust.
Avoid contact with eyes, skin and clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Discard contaminated clothing and shoes.
Keep tightly closed.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**TIN, FOIL****0526**

PRODUCT INFORMATION

Name: Tin, Foil, 1.0mm Thick, 99.9%

Chinese Name: 錫箔

CAS #: 7440-31-5

Molecular formula: Sn

Synonyms: Silver matt powder * tin (ACGIN:OSHA) * tin (alpha) * tin flake * tin powder * zinn (German) *

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: Shiny silver foil

Melting Point: 231.9°C

Specific Gravity: 7.310

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Extinguishing Media: Use extinguishing media appropriate to surrounding fire conditions.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents, sulfur, strong bases, halogens

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

HEALTH HAZARD DATA

Acute Effects:

May cause skin irritation.

May cause eye irritation.

May be harmful by inhalation, ingestion, or skin absorption.

FIRST AID MEASURES

If inhaled, remove to fresh air. Flush skin with water.

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

PREVENTATIVE MEASURES

NIOSH/MSHA-approved respirator.

Compatible chemical-resistant gloves.

Chemical safety goggles.

Safety shower and eye bath.

Mechanical exhaust required.

Avoid contact and inhalation.

Wash thoroughly after handling.

Keep container closed.

ENVIRONMENTAL PROTECTION DATA

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Wear protective equipment.
Sweep up, place in a bag and hold for waste disposal.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

TRYPSIN

0527

PRODUCT INFORMATION

Name: Trypsin From Bovine Pancreas

Chinese Name: 胰臟

CAS #: 9002-07-7

Synonyms: Parenzyme * parenzymol * tryptar * trypure * u-4858 *

RISK SYMBOL

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PHYSICAL DATA

No data available.

FIRE AND EXPLOSION DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

REACTIVITY DATA

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

The toxicological properties have not been thoroughly investigated.

Material is irritating to mucous membranes and upper respiratory tract.

May be harmful by inhalation, ingestion, or skin absorption. Causes eye and skin irritation.

May cause allergic respiratory and skin reactions.

FIRST AID MEASURES

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

In case of contact, immediately wash skin with soap and copious amounts of water.

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

PREVENTATIVE MEASURES

Safety shower and eye bath.

Wash thoroughly after handling.

Remove and wash contaminated clothing promptly.

Do not breathe dust.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Keep tightly closed.

Store away from heat.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.
Sweep up, place in a bag and hold for waste disposal.
Avoid raising dust.

Material Safety Data Sheet

City University of Hong Kong

MSDS

UREASE

0528

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PRODUCT INFORMATION

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Name: Urease From Jack Beans, Powder,
Chinese Name: 脲酶, 尿素
CAS #: 9002-13-5
Synonyms: Jack bean urease *

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RISK SYMBOL

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PHYSICAL DATA

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Appearance And Odor: Solid.
Solubility: Water -soluble

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FIRE AND EXPLOSION DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam. Water spray.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

REACTIVITY DATA

Stability: Stable.

Conditions To Avoid: Inhibited by heavy metal ions.

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

May cause irritation.

Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

PREVENTATIVE MEASURES

NIOSH/MSHA-approved respirator.

Mechanical exhaust.

Compatible chemical-resistant gloves.

Chemical safety goggles.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.

Sweep up, place in a bag and hold for waste disposal.

Ventilate area and wash spill site after material pickup is complete. Avoid raising dust.

Material Safety Data Sheet

City University of Hong Kong

MSDS**SEBACOYL CHLORIDE****0529**

PRODUCT INFORMATION

Name: Sebacoyl Chloride

Chinese Name: 皮脂[®]氯, 泌脂[®]氯

CAS #: 111-19-3

Molecular formula: C₁₀H₁₆Cl₂O₂

Synonyms:

Decanedioic dichloride * decanedioyl chloride * sebacic acid chloride * sebacic acid dichloride * sebacic dichloride * sebacoyl chloride (6ci,8ci) * sebacoyl dichloride * sebacyl chloride *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Colorless liquid

Boiling Point: 168°C/12mm

Flashpoint 235.40°F (113°C)

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Specific Gravity: 1.119

FIRE AND EXPLOSION DATA

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam. Water spray.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Alcohols, oxidizing agents, strong bases, sensitive to moisture

Hazardous Combustion Or Decomposition Products:

Carbon monoxide, carbon dioxide, hydrogen chloride gas, phosgene gas

HEALTH HAZARD DATA

Acute Effects:

Harmful if swallowed, inhaled, or absorbed through skin. Causes burns.

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin.

Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

Assure adequate flushing of the eyes by separating the eyelids with fingers.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician. Remove and wash contaminated clothing promptly.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Use only in a chemical fume hood.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Safety shower and eye bath.
Faceshield (8-inch minimum).
Do not breathe vapor.
Do not get in eyes, on skin, on clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Corrosive.
Lachrymator.
Keep tightly closed.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**DETTOL****0530**

PRODUCT INFORMATION

Name: 4-Chloro-3,5-Dimethylphenol

Chinese Name: 滴露

CAS #: 88-04-0

Molecular formula: C₈H₉ClO

Synonyms:

Benzytol * 4-chloro-3,5-dimethylphenol * 2-chloro-5-hydroxy-1,3- dimethylbenzene * 4-chloro-1-hydroxy-3,5-dimethylbenzene * 2-chloro-5- hydroxy-m-xylene * chloro-xyleneol * p-chloro-m-xyleneol * 2-chloro-m- xylenol * 4-chloro-3,5-xyleneol * dession * dettol * espadol * husept extra * nipacide mx * ottasept * ottasept extra * pcmx * phenol, 4- chloro-3,5-dimethyl- * rba 777 *

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: Solid.

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Melting Point: 114 To 116°C

FIRE AND EXPLOSION DATA

Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents, strong bases

Hazardous Combustion Or Decomposition Products:

Toxic fumes of: carbon monoxide, carbon dioxide, hydrogen chloride gas

HEALTH HAZARD DATA

Acute Effects:

Harmful if swallowed.

May be harmful if inhaled.

May be harmful if absorbed through the skin.

Causes eye and skin irritation.

Material is irritating to mucous membranes and upper respiratory tract.

Depending on the intensity and duration of exposure, effects may vary from mild irritation to severe destruction of tissue.

Prolonged Contact Can Cause:

Damage to the eyes

Severe irritation or burns.

Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

In case of contact, immediately wash skin with soap and copious amounts of water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Mechanical exhaust required.

Safety shower and eye bath.

Do not breathe dust.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Harmful solid.

Irritant.

Keep tightly closed.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.

Sweep up, place in a bag and hold for waste disposal.

Avoid raising dust.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ACETYL CHLORIDE****0531**

PRODUCT INFORMATION

Name: Acetyl Chloride

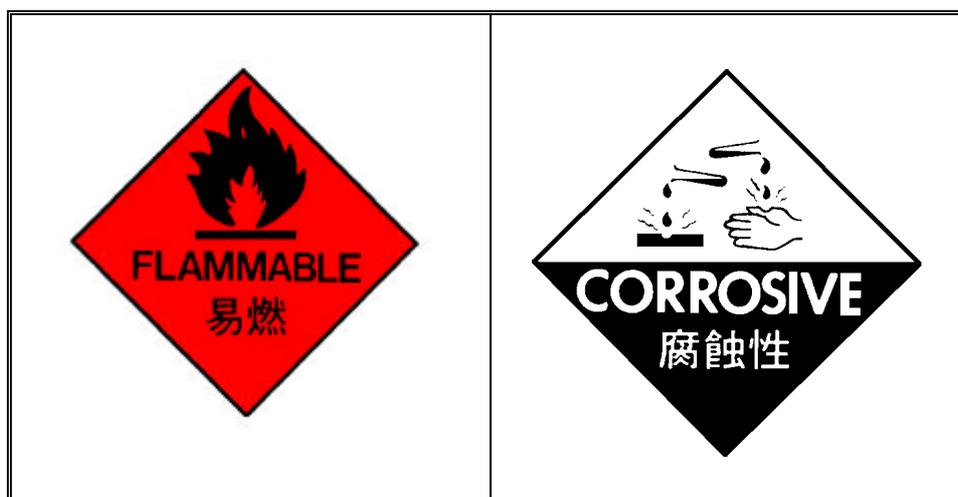
Chinese Name: 乙酰氯

CAS #: 75-36-5

Molecular formula: C₂H₃ClO

Synonyms: Acetic acid, chloride * acetic chloride * ethanoyl chloride * RCRA waste number u006 *

RISK SYMBOL



PHYSICAL DATA

Boiling Point: 52°C

Melting Point: -112°C

Flashpoint 40°F(4°C)

Explosion Limits In Air: Upper 19 % Lower 7.3 %

Vapor Pressure: 1,671.461 mmHg

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Specific Gravity: 1.104

Vapor Density: 2.7 g/l

FIRE AND EXPLOSION DATA

Extinguishing Media: Carbon dioxide. Do not use water.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards:

Flammable liquid. Emits toxic fumes under fire conditions. Vapor may travel considerable distance to source of ignition and flash back. Water hydrolyzes material liberating acidic gas which in contact with metal surfaces can generate flammable and/or explosive hydrogen gas.

REACTIVITY DATA

Incompatibilities: Alcohols, oxidizing agents, strong bases

Hazardous Combustion Or Decomposition Products: Carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Acute Effects:

Harmful if swallowed, inhaled, or absorbed through skin.

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin.

Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

To the best of our knowledge, the chemical, physical, and

Toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

Assure adequate flushing of the eyes by separating the eyelids with fingers.

PREVENTATIVE MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Safety shower and eye bath.

Use only in a chemical fume hood.

Do not breathe vapor.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Remove and wash contaminated clothing promptly.

Keep tightly closed.

Store in a cool dry place.

Keep away from heat, sparks, and open flame.

Do not allow contact with water.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.

Shut off all sources of ignition.

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors.

Material Safety Data Sheet

City University of Hong Kong

MSDS HEXANE MIXTURE OF ISOMERS 0532

PRODUCT INFORMATION

Name: Hexane Mixture Of Isomers, For Residue Analysis

Chinese Name: 己烷

CAS #: 38719-68-5

Synonyms:

Esani (Italian) * gettysolve-b * heksan (polish) * n-hexane (ACGIN: OSHA) * hexanen (Dutch) * hexyl hydride * nci-c60571 *

RISK SYMBOL



PHYSICAL DATA

Boiling Point: 66 - 70°C

Flashpoint -78,8 F(-26°C)

Specific Gravity: 0,67

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Use water spray to cool fire-exposed containers.

Unusual Fire And Explosions Hazards:

Flammable liquid. Vapor may travel considerable distance to source of ignition and flash back. Emits toxic fumes under fire conditions. Container explosion may occur under fire conditions.

REACTIVITY DATA

Stability: Stable.

Incompatibilities: Oxidizing agents, incompatible with: chlorine, fluorine, magnesium perchlorate.

Hazardous Combustion Or Decomposition Products: Carbon monoxide, carbon dioxide

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

May cause eye irritation.

Material may be irritating to mucous membranes and upper respiratory tract.

Causes skin irritation.

May be harmful by inhalation, ingestion, or skin absorption.

Vapor or mist is irritating to the eyes, mucous membranes and upper respiratory tract.

Can cause CNS depression.

Exposure can cause:

Lung irritation, chest pain and edema which may be fatal.

Headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.

Neurotoxic effects

Prolonged or repeated contact with skin can cause defatting and dermatitis. Contact with eyes can cause redness, tearing, and blurred vision. Ingestion may cause gastrointestinal irritation.

Chronic Effects:

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Target organ(s): Peripheral nervous system, kidneys, testes, hexane

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.
In case of contact, immediately wash skin with soap and copious amounts of water.
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

PREVENTATIVE MEASURES

NIOSH/MSHA-approved respirator.
Compatible chemical-resistant gloves.
Chemical safety goggles.
Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.
Safety shower and eye bath.
Use only in a chemical fume hood.
Do not breathe vapor.
Avoid contact with eyes, skin and clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Wash contaminated clothing before reuse.
Keep away from heat, sparks, and open flame.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Cover with an activated carbon adsorbent, take up and place in closed containers. Transport outdoors.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

LACMOID

0533

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PRODUCT INFORMATION

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Name: Lacmoid
Chinese Name: 純石蕊
CAS #: 33869-21-5

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RISK SYMBOL

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PHYSICAL DATA

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Appearance And Odor: Black powder

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FIRE AND EXPLOSION DATA

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Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents

Hazardous Combustion Or Decomposition Products:

Toxic fumes of: carbon monoxide, carbon dioxide nitrogen oxides

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

Causes eye and skin irritation.

Material is irritating to mucous membranes and upper respiratory tract.

To the best of our knowledge, the chemical, physical, and

Toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

In case of contact, immediately wash skin with soap and copious amounts of water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Chemical safety goggles.

Rubber gloves.

NIOSH/MSHA-approved respirator.

Safety shower and eye bath.

Mechanical exhaust required.

Avoid contact and inhalation.

Do not get in eyes, on skin, on clothing.

Wash thoroughly after handling.

Irritant.

Keep tightly closed.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Sweep up, place in a bag and hold for waste disposal.

Avoid raising dust.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD CHLORIDE****0534**

PRODUCT INFORMATION

Name: Lead Chloride, 99%

Chinese Name: 氯化鉛(II)

CAS #: 7758-95-4

Molecular formula: CL₂PB

Synonyms: Lead(2+) chloride * lead (ii) chloride * lead dichloride * plumbous chloride *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: White powder and chunks

Boiling Point: 950°C

Melting Point: 501°C

Vapor Pressure: 1mm 547°C

Specific Gravity: 5.850

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Extinguishing Media: Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents, strong acids

Hazardous Combustion Or Decomposition Products: Lead/lead oxides, hydrogen chloride gas

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

May cause eye irritation.

May cause skin irritation.

To the best of our knowledge, the chemical, physical, and

Toxicological properties have not been thoroughly investigated.

Chronic Effects:

Carcinogen.

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Target organ(s): Blood, kidneys, Nerves, female reproductive system, male reproductive system

Additional Information:

Lead salts have been reported to cross the placenta and to induce embryo- and feto- mortality. They also have teratogenic effect in some animal species. No teratogenic effects have been reported with exposure to organometallic lead compounds. Adverse effects of lead on human reproduction, embryonic and fetal development and postnatal (e.g., mental) development have been reported. Excessive exposure can affect blood, nervous and digestive systems. The synthesis of hemoglobin is inhibited and results in anemia. If left untreated, neuromuscular dysfunction, possible paralysis and encephalopathy can result. Additional symptoms of overexposure include: joint and muscle pain, weakness of the extensor muscles (frequently the hand and wrist), headache, dizziness, abdominal pain, diarrhea, constipation, nausea, vomiting, blue line on the gums, insomnia and metallic taste. High body levels produce increased cerebrospinal pressure, brain damage, stupor leading to coma and often death.

FIRST AID MEASURES

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Safety shower and eye bath.

Use only in a chemical fume hood.

Do not breathe dust.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Carcinogen.

Harmful dust.

Reproductive hazard.

Keep tightly closed.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Wear disposable coveralls and discard them after use.

Sweep up, place in a bag and hold for waste disposal.

Avoid raising dust.

Ventilate area and wash spill site after material pickup is complete.

Disposal Considerations:

The material should be dissolved in 1) water; 2) acid solution or 3) oxidized to a water-soluble state. Precipitate the material as the sulfide, adjusting the pH of the solution to 7 to complete precipitation. Filter the insolubles and dispose of them in a hazardous- waste site. Destroy any excess sulfide with sodium hypochlorite. Neutralize the solution before flushing down the drain. Observe all federal, state and local environmental regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS**LEAD(IV) ACETATE****0535****PRODUCT INFORMATION**

Name: Lead(IV) Acetate, 95%

Chinese Name: 乙酸鉛(II)

CAS #: 546-67-8

Molecular formula: $\text{Pb}(\text{O}_2\text{C}_2\text{H}_3)_4$

Synonyms: Lead acetate * lead tetraacetate * plumbic acetate *

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: White to off-white crystalline powder

FIRE AND EXPLOSION DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Oxidizer.

Unusual Fire And Explosions Hazards:

Emits toxic fumes under fire conditions. Contact with other material may cause fire.

REACTIVITY DATA

Incompatibilities: Alcohols, strong acids, strong reducing agents, air sensitive, moisture sensitive

Hazardous Combustion Or Decomposition Products:

Toxic fumes of: carbon monoxide, carbon dioxide, lead/lead oxides

HEALTH HAZARD DATA

Acute Effects:

Harmful if swallowed, inhaled, or absorbed through skin.

Causes eye and skin irritation.

Material is irritating to mucous membranes and upper respiratory tract.

Chronic Effects:

Carcinogen.

May cause reproductive disorders.

Target organ(s):

Peripheral nervous system, central nervous system, female reproductive system, male reproductive system, blood, kidneys

Additional Information:

Lead salts have been reported to cross the placenta and to induce embryo- and feto- mortality. They also have teratogenic effect in some animal species. No teratogenic effects have been reported with exposure to organometallic lead compounds. Adverse effects of lead on human reproduction, embryonic and fetal development and postnatal (e.g., mental) development have been reported. Excessive exposure can affect blood, nervous and digestive systems. The synthesis of hemoglobin is inhibited and results in anemia. If left untreated, neuromuscular dysfunction, possible paralysis and encephalopathy can result. Additional symptoms of overexposure include: joint and muscle pain, weakness of the extensor muscles (frequently the hand and wrist), headache, dizziness, abdominal pain, diarrhea, constipation, nausea, vomiting, blue line on the gums, insomnia and metallic taste. High body levels produce increased cerebrospinal pressure, brain damage, stupor leading to coma and often death.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

The above information is believed to be accurate to the best of our knowledge.
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If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.
If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant
Gloves, safety goggles, other protective clothing.
Safety shower and eye bath.
Use only in a chemical fume hood.
Do not breathe dust.
Do not get in eyes, on skin, on clothing.
Avoid prolonged or repeated exposure.
Readily absorbed through skin.
Wash thoroughly after handling.
Toxic.
Irritant.
Carcinogen.
Reproductive hazard.
Keep tightly closed.
Air and moisture sensitive
Do not store near, nor allow contact with, clothing and other
Combustible material.
Store under nitrogen.
Refrigerate.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Sweep up, place in a bag and hold for waste disposal.
Avoid raising dust.
Ventilate area and wash spill site after material pickup is complete.

Disposal Considerations :

The material should be dissolved in 1) water; 2) acid solution or 3) oxidized to a water-soluble state. Precipitate the material as the sulfide, adjusting the pH of the solution to 7 to complete precipitation. Filter the insolubles and dispose of them in a hazardous- waste site. Destroy any excess sulfide with sodium hypochlorite. Neutralize the solution before flushing down the drain. Observe all federal, state and local environmental regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS

LEAD OXIDE, RED

0536

PRODUCT INFORMATION

Name: Lead Oxide, Red, Powder, 1-2micron, 99%

Chinese Name: 紅鉛, 鉛丹, 紅丹

CAS #: 1314-41-6

Molecular formula: Pb_3O_4

Synonyms:

C.I. 77578 * C.I. pigment red 105 * gold satinobre * heuconin 5 * lead orthoplumbate * lead oxide (Pb_3O_4) * lead oxide (3:4) * lead oxide red * lead tetraoxide * lead tetroxide * mennige * mineral orange * mineral red * minium * minium non-setting rl 95 * orange lead * Paris red * pigment red 105 * plumboplumbic oxide * red lead * red lead oxide * sandix * saturn red * trilead tetraoxide * trilead tetroxide *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Orange powder

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The above information is believed to be accurate to the best of our knowledge.
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FIRE AND EXPLOSION DATA

Extinguishing Media: Water spray.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Oxidizer.

Unusual Fire And Explosions Hazards:

Contact with other material may cause fire. Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong reducing agents

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

Causes eye and skin irritation.

Material is irritating to mucous membranes and upper respiratory tract.

Chronic Effects:

May cause reproductive disorders.

Target organ(s): Blood, kidneys, nerves, female reproductive system, male reproductive system

Additional Information:

Lead salts have been reported to cross the placenta and to induce embryo- and feto- mortality. They also have teratogenic effect in some animal species. No teratogenic effects have been reported with exposure to organometallic lead compounds. Adverse effects of lead on human reproduction, embryonic and fetal development and postnatal (e.g., mental) development have been reported. Excessive exposure can affect blood, nervous and digestive systems. The synthesis of hemoglobin is inhibited and results in anemia. If left untreated, neuromuscular dysfunction, possible paralysis and encephalopathy can result. Additional symptoms of overexposure include: joint and muscle pain, weakness of the extensor muscles (frequently the hand and wrist), headache, dizziness, abdominal pain, diarrhea, constipation, nausea, vomiting, blue line on the gums, insomnia and metallic taste. High body levels produce increased cerebrospinal pressure, brain damage, stupor leading to coma and often death.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

The above information is believed to be accurate to the best of our knowledge.
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If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Use only in a chemical fume hood.

Safety shower and eye bath.

Avoid breathing dust.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Irritant.

Harmful dust.

Reproductive hazard.

Keep tightly closed.

Keep away from combustible materials, heat, sparks, and open flame.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Cover with dry lime or soda ash, pick up, keep in a closed container and hold for waste disposal.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

LEISHMAN'S STAIN

0537

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PRODUCT INFORMATION

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Name: Leishman's Stain
Chinese Name:
CAS #: 12627-53-1

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RISK SYMBOL

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PHYSICAL DATA

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Appearance And Odor: Green powder

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FIRE AND EXPLOSION DATA

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Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

REACTIVITY DATA

Stability: Stable.

Incompatibilities: Oxidizing agents

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

May cause irritation.

The toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Mechanical exhaust required.

ENVIRONMENTAL PROTECTION DATA

Wear protective equipment.

Sweep up, place in a bag and hold for waste disposal.

Avoid raising dust.

Ventilate area and wash spill site after material pickup is complete.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Material Safety Data Sheet

City University of Hong Kong

MSDS**3-AMINOPHTHALHYDRAZIDE****0538****PRODUCT INFORMATION**

Name: 3-Aminophthalhydrazide*

Chinese Name: 露明諾

CAS #: 521-31-3

Molecular formula: C₈H₇N₃O₂

Synonyms:

5-amino-2,3-dihydro-1,4-phthalazinedione * 3-aminophthalhydrazide * 3-aminophthalic acid hydrazide * luminol *

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: Pale-yellow to tan powder

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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FIRE AND EXPLOSION DATA

Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents, strong acids, strong bases, strong reducing agents

Hazardous Combustion Or Decomposition Products:

Toxic fumes of: carbon monoxide, carbon dioxide nitrogen oxides

HEALTH HAZARD DATA

Acute Effects

May be harmful by inhalation, ingestion, or skin absorption.

Causes eye and skin irritation.

Material is irritating to mucous membranes and upper respiratory tract.

To the best of our knowledge, the chemical, physical, and

Toxicological properties have not been thoroughly investigated.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

In case of contact, immediately wash skin with soap and copious amounts of water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician. Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Chemical safety goggles.

Rubber gloves.

NIOSH/MSHA-approved respirator.

Safety shower and eye bath.

Mechanical exhaust required.

Do not breathe dust.

Avoid contact with eyes, skin and clothing.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Wash thoroughly after handling.

Irritant.

Keep tightly closed.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

LYCOPODIUM

0539

PRODUCT INFORMATION

Name: Lycopodium
Chinese Name: 石松粉
CAS #:NONE

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: Form - Solid Color - Pale Beige
Solubility: Water -Insoluble

FIRE AND EXPLOSION DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards:

Hazardous Polymerization: Will not occur. Highly flammable.

Additional Information: Moisture sensitive

REACTIVITY DATA

Data Not Available

HEALTH HAZARD DATA

Data Not Available

FIRST AID MEASURES

Take off immediately all contaminated clothing.

After contact with skin, wash immediately with plenty of soap and water.

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

PREVENTATIVE MEASURES

Chemical safety goggles.

Protect from moisture.

Keep away from sources of ignition - no smoking.

ENVIRONMENTAL PROTECTION DATA

Place in appropriate container.

Wash spill site with soap solution.

Flush spill area with copious amounts of water.

Material Safety Data Sheet

City University of Hong Kong

MSDS MANGANESE(II) SULFATE HYDRATE 0540

PRODUCT INFORMATION

Name: Manganese(II) Sulfate Hydrate, 99.99+%

Chinese Name: 硫(VI)酸錳(IV)

CAS #: 15244-36-7

Molecular formula: MnO_4S

Synonyms:

Manganese sulfate (1:1) * manganese (2+) sulfate (1:1) * manganese sulphate * manganous sulfate * man-gro *
NCI c61143 * sorba-spray mn * sulfuric acid, manganese (ii) salt (1:1) (8ci) *

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: Pink crystalline powder and chunks

Specific Gravity: 2.090

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

FIRE AND EXPLOSION DATA

Extinguishing Media: Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong acids

Hazardous Combustion Or Decomposition Products: Sulfur oxides

HEALTH HAZARD DATA

Acute Effects:

Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds.

Material is irritating to mucous membranes and upper respiratory tract.

Harmful if swallowed, inhaled, or absorbed through skin.

Causes eye and skin irritation.

Chronic Effects: Target organ(s): Central nervous system, Lungs

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

Assure adequate flushing of the eyes by separating the eyelids with fingers.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

The above information is believed to be accurate to the best of our knowledge.
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Safety shower and eye bath.
Use only in a chemical fume hood.
Do not breathe dust.
Do not get in eyes, on skin, on clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Wash contaminated clothing before reuse.
Irritant.
Keep tightly closed.
Refrigerate.
Hygroscopic

ENVIRONMENTAL PROTECTION DATA

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Sweep up, place in a bag and hold for waste disposal.
Avoid raising dust.
Ventilate area and wash spill site after material pickup is complete.

Disposal Considerations:

The material should be dissolved in 1) water; 2) acid solution or 3) oxidized to a water-soluble state. Precipitate the material as the sulfide, adjusting the pH of the solution to 7 to complete precipitation. Filter the insolubles and dispose of them in a hazardous- waste site. Destroy any excess sulfide with sodium hypochlorite. Neutralize the solution before flushing down the drain. Observe all federal, state and local environmental regulations.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHYL ETHER****0541****PRODUCT INFORMATION**

Name: Methyl Ether, 99+%

Chinese Name: 二甲醚

CAS #: 115-10-6

Molecular formula: C₂H₆O

Synonyms:

Demeon d * dimethyl oxide * DME * dymel a * ether, dimethyl * ether, methyl * methane, oxybis- (9ci) * methoxymethane * wood ether *

RISK SYMBOL**PHYSICAL DATA**

Appearance And Odor: Colorless gas

Boiling Point: -24.8°C

Melting Point: -141°C

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Explosion Limits In Air: Upper 27%, Lower 3.4%
Autoignition Temperature: 662°F (349°C)
Vapor Pressure: 4000mm 20°C >760mm 25°C
Vapor Density: 1.62

FIRE AND EXPLOSION DATA

Extinguishing Media:

Do not extinguish burning gas if flow cannot be shut off immediately. Use water spray or fog nozzle to keep cylinder cool. Move cylinder away from fire if there is no risk.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Danger: flammable high-pressure liquid and gas.

Unusual Fire And Explosions Hazards:

May form explosive mixtures with air. Vapor may travel considerable distance to source of ignition and flash back.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents, strong acids, halogens

Hazardous Combustion Or Decomposition Products: Toxic fumes of: carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Acute Effects:

May be toxic by inhalation and if swallowed.

Vapor or mist is irritating to the eyes, mucous membranes and upper respiratory tract.

Causes skin irritation.

Exposure can cause:

Intoxication, blurred vision, headaches, dizziness, excitation, pharyngitis, convulsions, respiratory distress, asphyxia, pneumonitis, unconsciousness and death. Liver, kidney and brain injury may occur. Contact with skin or eyes may result in frostbite, redness, pain and blurred vision due to rapid evaporation of liquid.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

PREVENTATIVE MEASURES

Chemical safety goggles.
Compatible chemical-resistant gloves.
Mechanical exhaust required.
NIOSH/MSHA-approved respirator in nonventilated areas and/or for exposure above the ACGIN TLV.
Do not breathe gas.
Do not get in eyes, on skin, on clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Irritant.
Keep tightly closed.
Keep away from heat, sparks, and open flame.
Cylinder temperature should not exceed 125°F (52°C).
Store and use with adequate ventilation.
Contents under pressure.
Warning: suck-back into cylinder may cause rupture.
Use back-flow-preventive device in piping.
Use with equipment rated for cylinder pressure, and of compatible materials of construction. Close valve when not in use and when empty.
Make sure cylinder is properly secured when in use or stored.

Handling And Storage:

May form explosive peroxides on exposure to air. Reacts explosively with ozone, fluorine, and chromic anhydride.

ENVIRONMENTAL PROTECTION DATA

Evacuate area and keep personnel upwind.
Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Shut off leak if there is no risk.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**METHYL ACETATE****0542**

PRODUCT INFORMATION

Name: Methyl Acetate

Chinese Name: 醋酸甲酯

CAS #: 79-20-9

Molecular formula: C₃H₆O₂

Synonyms:

Acetate de methyle (French) * devoton * ethyl ester of monoacetic acid * methylacetaat (Dutch) * methylacetat (German) * methyl acetate (ACGIN:OSHA) * methyle (acetate de) (French) * methylester kiselinu octove (Czech) * methyl ethanoate * metile (acetato di) (Italian) * octan metylu (polish) * tereton *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Colorless liquid

Boiling Point: 56 To 58°C

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Flashpoint: 3.20°F (-16°C)
Explosion Limits In Air: Upper 16%, Lower 3.1%
Autoignition Temperature: 849° F (453°C)
Vapor Pressure: 165mm 20° C
Specific Gravity: 0.934
Vapor Density: 2.55

FIRE AND EXPLOSION DATA

Extinguishing Media:

Carbon dioxide, dry chemical powder or appropriate foam. Water may be effective for cooling, but may not effect extinguishment.

Special FIREFIGHTING PROCEDURES:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Use water spray to cool fire-exposed containers.

Unusual Fire And Explosions Hazards:

Danger: extremely flammable. Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions. Forms explosive mixtures in air.

REACTIVITY DATA

Incompatibilities: Oxidizing agents, bases, acids, moisture, heat

Hazardous Combustion Or Decomposition Products: Toxic fumes of: carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

Vapor or mist is irritating to the eyes, mucous membranes and upper respiratory tract.

Causes skin irritation.

Exposure can cause:

Nausea, headache and vomiting

Narcotic Effect: Target organ(s): eyes, kidneys, central nervous system,

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Assure adequate flushing of the eyes by separating the eyelids with fingers.

In case of contact, immediately wash skin with soap and copious amounts of water.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

If inhaled, remove to fresh air.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Safety shower and eye bath.

Use only in a chemical fume hood.

Faceshield: (8-inch minimum).

Do not breathe vapor.

Do not get in eyes, on skin, on clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Irritant.

Harmful liquid and fumes.

Keep tightly closed.

Keep away from heat, sparks, and open flame.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.

Shut off all sources of ignition.

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Cover with an activated carbon adsorbent, take up and place in closed containers. Transport outdoors.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

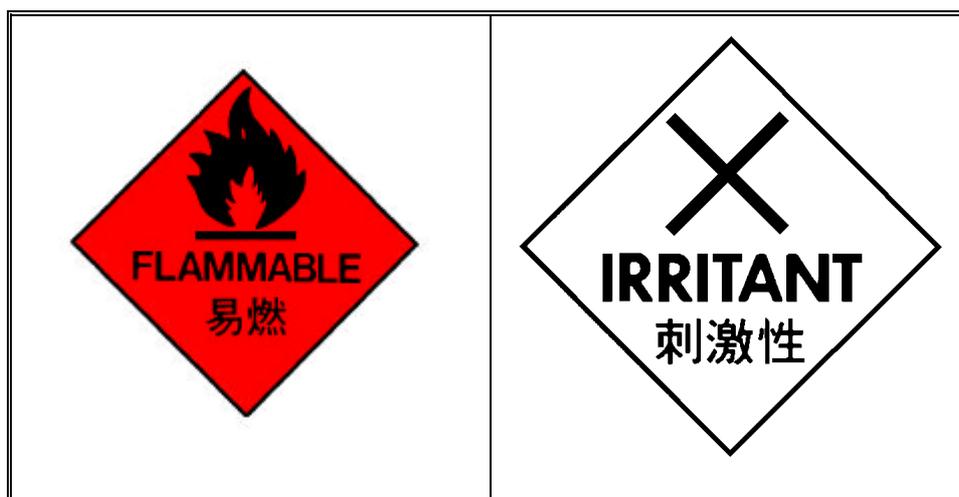
City University of Hong Kong

MSDS METHYL 2-METHYLPENTANOATE 0543

PRODUCT INFORMATION

Name: Methyl 2-Methylpentanoate, 98+%
Chinese Name:
CAS #: 2177-77-7
Molecular formula: C₇H₁₄O₂

RISK SYMBOL



PHYSICAL DATA

Boiling Point: 45°C/.2mm.
Flashpoint: 85°F(29.44°C)
Specific Gravity: 0.878

FIRE AND EXPLOSION DATA

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Flammable liquid.

Unusual Fire And Explosions Hazards:

Vapor may travel considerable distance to source of ignition and flash back. Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents

Hazardous Combustion Or Decomposition Products: Toxic fumes of: carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

May cause eye irritation.

May cause skin irritation.

Material may be irritating to mucous membranes and upper respiratory tract.

Prolonged or repeated exposure to skin causes defatting and dermatitis.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

In case of contact, immediately wash skin with soap and copious amounts of water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

Remove and wash contaminated clothing promptly.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Safety shower and eye bath.

Mechanical exhaust required.

Use nonsparking tools.

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Do not breathe vapor.
Do not get in eyes, on skin, on clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Keep tightly closed.
Keep away from heat, sparks, and open flame.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Shut off all sources of ignition.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

MILLON'S REAGENT

0544

PRODUCT INFORMATION

Name: Millon's Reagent
Chinese Name: 米隆試劑
CAS #:NONE

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Form - clear liquid, color - colorless
Solubility: Water -soluble
Specific Gravity: 1.990
pH Value: Acidic

FIRE AND EXPLOSION DATA

Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Use extinguishing media appropriate to surrounding fire conditions.

Unusual Fire And Explosions Hazards: Hazardous polymerization, will not occur.

Additional Information: Noncombustible.

REACTIVITY DATA

Hazardous Combustion Or Decomposition Products:

When heated to decomposition it may emit: toxic fumes. Irritating fumes.

HEALTH HAZARD DATA

Very toxic by inhalation, in contact with skin and if swallowed.

Danger of cumulative effects.

Causes burns.

Additional Information: In case of fire, development of toxic and irritant decomposition products.

FIRST AID MEASURES

Take off immediately all contaminated clothing.

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

If swallowed, seek medical advice immediately and show this container or label.

After contact with skin, wash immediately with plenty of soap and water.

In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

PREVENTATIVE MEASURES

In case of insufficient ventilation, wear suitable

Respiratory equipment.

Compatible chemical-resistant gloves.

Chemical safety goggles.

Wear suitable protective clothing.

Do not breathe vapor.

Avoid contact with skin and eyes.

The above information is believed to be accurate to the best of our knowledge.
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When using do not eat or drink.
When using do not smoke.
Keep container tightly closed.
Keep container in a well-ventilated place.
Keep locked up and out of the reach of children.
Keep away from food, drink and animal feeding stuffs.
Use only in well ventilated areas.

Handling And Storage: Solution containing mercuric nitrate 17% w/v and nitric acid 34% w/v.

ENVIRONMENTAL PROTECTION DATA

Absorb on sand or vermiculite and place in closed containers for disposal.
Mix with solid sodium bicarbonate.
Flush spill area with copious amounts of water.

Material Safety Data Sheet

City University of Hong Kong

MSDS

NUTRIENT AGAR

0545

PRODUCT INFORMATION

Name: Nutrient Agar, For Microbiology*
Chinese Name: 營養素 瓊脂
CAS #:NONE

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: Form – solid, color - pale beige
Solubility: Water -Soluble
pH Value: ~7.4 (In Water)

FIRE AND EXPLOSION DATA

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The above information is believed to be accurate to the best of our knowledge.
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Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.
Special Firefighting Procedures:
Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Hazardous polymerization, will not occur.
Additional Information: Hygroscopic, moisture sensitive

REACTIVITY DATA

Data Not Available

HEALTH HAZARD DATA

Data Not Available

FIRST AID MEASURES

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
If necessary after contact with skin, wash immediately with plenty of soap and water.

PREVENTATIVE MEASURES

Wear dust mask.
Wear suitable gloves.
Chemical safety goggles.
Do not breathe dust.
Avoid contact with skin and eyes.
Keep container tightly closed.
Keep container in a well-ventilated place.
Avoid formation of dust

ENVIRONMENTAL PROTECTION DATA

Avoid raising dust.
Place in appropriate container.
Wash spill site with soap solution.

The above information is believed to be accurate to the best of our knowledge.
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Flush spill area with copious amounts of water.

Material Safety Data Sheet

City University of Hong Kong

MSDS

PEPTONE

0546

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PRODUCT INFORMATION

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Name: Peptone Yeast Extract Iron Citrate Agar, F Or Microbiology*
Chinese Name:
CAS #:NONE

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RISK SYMBOL

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PHYSICAL DATA

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Appearance And Odor: Solid.

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FIRE AND EXPLOSION DATA

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Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Stability: Stable.

Incompatibilities: Strong oxidizing agents, protect from moisture.

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

May cause eye irritation.

May cause skin irritation.

Material may be irritating to mucous membranes and upper respiratory tract.

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

In case of contact, immediately wash skin with soap and copious amounts of water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Chemical safety goggles.

Compatible chemical-resistant gloves.

NIOSH/MSHA-approved respirator.

Safety shower and eye bath.

Mechanical exhaust required.

Avoid inhalation.

Avoid contact with eyes, skin and clothing.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Keep tightly closed.

Store in a cool dry place.

The above information is believed to be accurate to the best of our knowledge.
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ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**ANILINE CHLORIDE****0547****PRODUCT INFORMATION**

Name: Aniline Chloride, 99%

Chinese Name: 氯化苯胺

CAS #: 142-04-1

Molecular formula: C₆H₇N

Synonyms:

Aniline chloride * aniline hydrochloride (6ci,8ci) * anilinium chloride * chlorhydrate d'aniline (French) * chlorid anilinu (Czech) * C.I. 76001 * nci-c03736 hydrochloride * phenylamine hydrochloride * phenylammonium chloride * sul anilinoiva (Czech) * usaf ek-442 *

RISK SYMBOL**PHYSICAL DATA**

Appearance And Odor: Green crystalline powder

Melting Point: 196°C To 198°C

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lashpoint: 380°F(193.33°C)
Vapor Density: 4.46

FIRE AND EXPLOSION DATA

Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Conditions To Avoid: May discolor on exposure to light.

Incompatibilities: Strong oxidizing agents

Hazardous Combustion Or Decomposition Products:

Toxic fumes of: carbon monoxide, carbon dioxide, nitrogen oxides, hydrogen chloride gas

HEALTH HAZARD DATA

Acute Effects:

May be fatal if inhaled, swallowed, or absorbed through skin.

Vapor or mist is irritating to the eyes, mucous membranes and upper respiratory tract.

Causes skin irritation.

Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer.

Chronic Effects:

Possible carcinogen.

May cause allergic skin reaction.

Laboratory experiments have shown mutagenic effects.

Target organ(s): blood, central nervous system, bladder

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

Wash contaminated clothing before reuse.

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PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.
Safety shower and eye bath.
Use only in a chemical fume hood.
Do not breathe dust.
Avoid contact with eyes, skin and clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Highly toxic.
Irritant.
Possible carcinogen.
Possible mutagen.
Keep tightly closed.
Protect from light.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Sweep up, place in a bag and hold for waste disposal.
Avoid raising dust.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS PHOSPHORUS, STICK, YELLOW 0548

PRODUCT INFORMATION

Name: Phosphorus, Stick, Yellow

Chinese Name: 黃磷

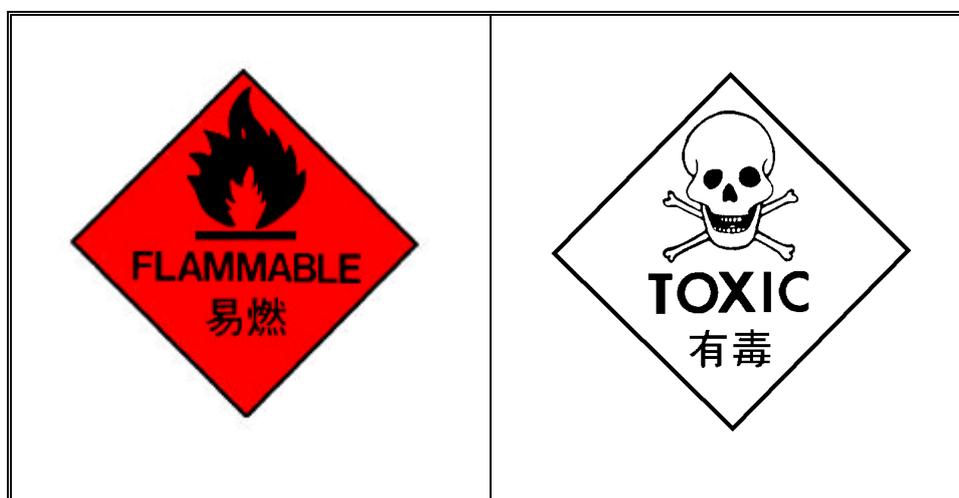
CAS #: 7723-14-0

Molecular formula: P

Synonyms:

Bonide blue death rat killer * common sense cockroach and rat preparations * fosforo bianco (italian) * gelber phosphor (german) * phosphore blanc (French) * phosphorous (white) * phosphorous yellow * phosphorus, yellow (ACGIN:OSHA) * rat-nip * tetrafosfor (Dutch) * tetraphosphor (german) * weiss phosphor (german) * white phosphorus * yellow phosphorus *

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: White to off-white to yellow chunks

City University of Hong Kong

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Autoignition Temperature: 86 F (29°C)
Vapor Pressure: 1mm 76.6°C
Vapor Density: .02

FIRE AND EXPLOSION DATA

Extinguishing Media:

Use approved class d extinguishers or smother with dry sand, dry ground limestone or dry clay. Do not use water.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Pyrophoric material.

Unusual Fire And Explosions Hazards:

Emits toxic fumes under fire conditions. Catches fire if exposed to air.

REACTIVITY DATA

Incompatibilities:

Halogens, halides, sulfur, oxidizing agents, copper, copper alloys, oxygen, store away from heat and direct sunlight.

Forms Explosive Mixtures With: Reducing agents

Hazardous Combustion Or Decomposition Products:

Thermal decomposition may produce toxic fumes of phosphorus oxides and/or phosphine.

HEALTH HAZARD DATA

Acute Effects:

May be fatal if inhaled, swallowed, or absorbed through skin.

High concentrations are extremely destructive to tissues of the mucous membranes and upper respiratory tract, eyes and skin.

Depending on the intensity and duration of exposure, effects may vary from mild irritation to severe destruction of tissue.

Chronic Effects: Stomach pains, vomiting, diarrhea.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

Assure adequate flushing of the eyes by separating the eyelids with fingers.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

The above information is believed to be accurate to the best of our knowledge.
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If swallowed, wash out mouth with water provided person is conscious. Call a physician.
Discard contaminated clothing and shoes.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Use only in a chemical fume hood.

Safety shower and eye bath.

Use nonsparking tools.

Avoid contact and inhalation.

Avoid prolonged or repeated exposure.

Wash thoroughly after handling.

Highly toxic.

Harmful solid and fumes.

Keep tightly closed.

Pyrophoric.

Heat-sensitive.

Container should be opened only by a technically qualified person.

Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.

Shut off all sources of ignition.

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors.

Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS**PHENYL SALICYLATE****0549****PRODUCT INFORMATION**

Name: Phenyl Salicylate

Chinese Name: 水楊酸苯酯

CAS #: 118-55-8

Molecular formula: $C_{13}H_{10}O_3$

Synonyms: Fenylester kyseliny salicylove (czech) * phenyl salicylate * salol *

RISK SYMBOL

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PHYSICAL DATA

Appearance And Odor: White crystals

Boiling Point: 175°C/12mm

Melting Point: 41 TO 43°C

Flashpoint: >230°F(>110°C)

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The above information is believed to be accurate to the best of our knowledge.
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FIRE AND EXPLOSION DATA

Extinguishing Media: Carbon dioxide, dry chemical powder or appropriate foam.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire And Explosions Hazards: Emits toxic fumes under fire conditions.

REACTIVITY DATA

Incompatibilities: Strong oxidizing agents, sensitive to light

Hazardous Combustion Or Decomposition Products: Toxic fumes of: carbon monoxide, carbon dioxide

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

Causes eye and skin irritation.

Material is irritating to mucous membranes and upper respiratory tract.

Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

Chronic effects

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

Wash contaminated clothing before reuse.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

Safety shower and eye bath.

Use only in a chemical fume hood.

Do not breathe dust.

Do not get in eyes, on skin, on clothing.

The above information is believed to be accurate to the best of our knowledge.
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Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Possible teratogen.
Irritant.
Possible sensitizer.
Keep tightly closed.
Protect from light.
Store in a cool dry place.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

SILICA

0550

PRODUCT INFORMATION

Name: Silica

Chinese Name: 矽石, 矽石

CAS #: 7631-86-9

Molecular formula: SiO₂

Synonyms:

Accusand * amorphous quartz * amorphous silica * borsil p * cryptocrystalline quartz * denka f 90 * denka fb 44 * ef 10 * f 44 * f 125 * fs 74 * fused quartz * fused silica * fuselex * fuselex rd 120 * fuselex rd 40-60 * fuselex za 30 * gp 7i * gp 11i * microcrystalline quartz * mr 84 * nalcast * optocil * optocil (quartz) * qg 100 * quartz glass * quartz sand * quarzsand (german) * rancosil * rd 8 * rd 120 * s-col * silica, amorphous-fused (ACGIN) * sga * silica, fused (OSHA) * silica, vitreous (9ci) * silicon dioxide * silicone dioxide * siltex * spectrosil * suprasil * suprasil w * vitreosil ir * vitreous quartz * vitreous silica * vitrified silica * y 40 *

RISK SYMBOL

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PHYSICAL DATA

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
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Appearance And Odor: Solid.

FIRE AND EXPLOSION DATA

Extinguishing Media:

Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

REACTIVITY DATA

Incompatibilities: Strong acids, protect from moisture.

Hazardous Combustion Or Decomposition Products: Nature of decomposition products not known.

HEALTH HAZARD DATA

Acute Effects:

Harmful if inhaled.

May be harmful if swallowed.

May be harmful if absorbed through the skin.

Causes eye irritation.

Material is irritating to mucous membranes and upper respiratory tract.

May cause skin irritation.

Chronic Effects: Target organ(s): lungs

FIRST AID MEASURES

In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes. Assure adequate flushing of the eyes by separating the eyelids with fingers.

In case of contact, immediately wash skin with soap and copious amounts of water.

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

PREVENTATIVE MEASURES

Chemical safety goggles.

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Compatible chemical-resistant gloves.
NIOSH/MSHA-approved respirator in nonventilated areas and/or for
Exposure above the ACGIN TLV.
Safety shower and eye bath.
Mechanical exhaust required.
Avoid contact and inhalation.
Wash thoroughly after handling.
Harmful dust.
Irritant.
Keep container closed.
Hygroscopic

ENVIRONMENTAL PROTECTION DATA

Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.
Sweep up, place in a bag and hold for waste disposal.
Avoid raising dust.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

**MSDS SODIUM HYPOCHLORITE, SOLUTION, 0551
AVAILABLE CHLORINE 4%****PRODUCT INFORMATION**

Name: Sodium Hypochlorite, Solution, Available Chlorine 4% (MINIMUM)

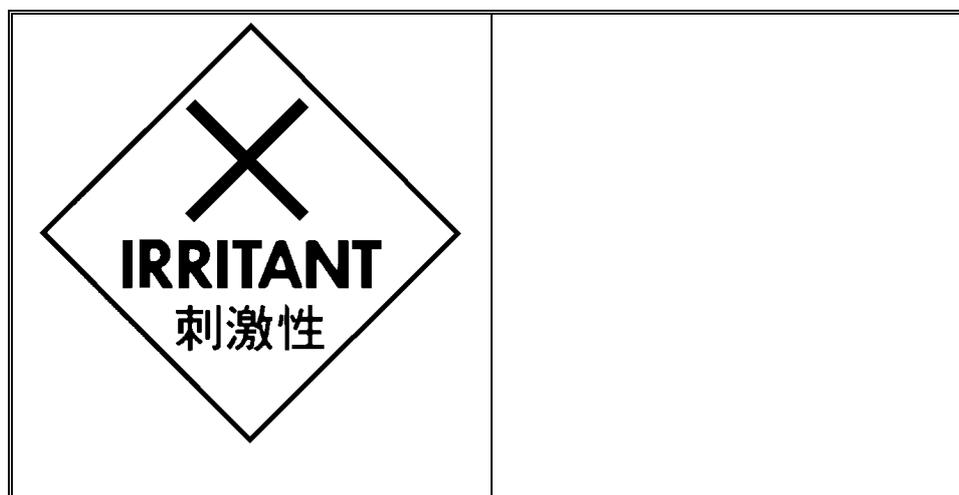
Chinese Name: 次氯酸鈉

CAS #: 7681-52-9

Molecular formula: NaClO

Synonyms:

Antiformin * b-k liquid * carrel-dakin solution * chloros * chlorox * clorox * dakins solution * deosan * hyclorite
* hypochlorite solution containing >7% available chlorine by wt. (un1791) * javex * klorocin * milton * neo-
cleaner * neoseptal cl * parozone * purin b * sodium chloride oxide * sodium hypochlorite * sodium oxychloride *
surchlor *

RISK SYMBOL**PHYSICAL DATA**

City University of Hong Kong

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The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Flashpoint: None
Vapor Pressure: 17.5mm 20°C
Specific Gravity: 1.097

FIRE AND EXPLOSION DATA

Extinguishing Media: Dry chemical powder.

Special Firefighting Procedures:

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Oxidizer.

Unusual Fire And Explosions Hazards:

Emits toxic fumes under fire conditions. May accelerate combustion. Contact with other material may cause fire.

REACTIVITY DATA

Stability: Stable.

Incompatibilities: Strong acids, organic materials, finely powdered metals,

Forms Explosive Mixtures With: Amines, ammonia, methanol

Hazardous Combustion Or Decomposition Products: Hydrogen chloride gas, chlorine, sodium/sodium oxides

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

Acute Effects:

May be harmful by inhalation, ingestion, or skin absorption.

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin.

Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

Chronic Effects:

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIN, NTP or EPA classification.

FIRST AID MEASURES

In case of contact, immediately flush eyes or skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.

Assure adequate flushing of the eyes by separating the eyelids with fingers.

The above information is believed to be accurate to the best of our knowledge.
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If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.
If swallowed, wash out mouth with water provided person is conscious. Call a physician.
Wash contaminated clothing before reuse. Discard contaminated shoes.

PREVENTATIVE MEASURES

Wear appropriate NIOSH/MSHA-approved respirator, chemical-resistant
Gloves, safety goggles, other protective clothing.
Use only in a chemical fume hood.
Safety shower and eye bath.
Faceshield: (8-inch minimum).
Do not get in eyes, on skin, on clothing.
Avoid prolonged or repeated exposure.
Wash thoroughly after handling.
Keep tightly closed.
Do not store near, nor allow contact with, clothing and other
Combustible material.

Handling And Storage:

Reacts violently with ammonium salts, aziridine, methanol, phenylacetonitrile sometimes resulting in explosions.
Reacts with primary aliphatic or aromatic amines to form explosively unstable n-chloroamines. Reaction with
formic acid becomes explosive at 55°C.

ENVIRONMENTAL PROTECTION DATA

Evacuate area.
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Absorb on sand or vermiculite and place in closed containers for disposal.
Ventilate area and wash spill site after material pickup is complete.

Material Safety Data Sheet

City University of Hong Kong

MSDS

VASELINE

0552

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PRODUCT INFORMATION

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Name: Vaseline, White
Chinese Name: 凡士林
CAS #:NONE

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RISK SYMBOL

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PHYSICAL DATA

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Appearance And Odor: Form – paste, Color - colorless , Odor - odorless
Flashpoint: 419°F (215°C)
Solubility: Water -insoluble

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FIRE AND EXPLOSION DATA

City University of Hong Kong

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Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.
Hazardous Polymerization: Will not occur.

REACTIVITY DATA

Hazardous Combustion Or Decomposition Products: Thermally stable up to 300°C

HEALTH HAZARD DATA

Data not available

FIRST AID MEASURES

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. If necessary

PREVENTATIVE MEASURES

Chemical safety goggles.
Keep container tightly closed.
Keep container in a well-ventilated place.

ENVIRONMENTAL PROTECTION DATA

Place in appropriate container.
Wash spill site with soap solution.
Flush spill area with copious amounts of water.

Material Safety Data Sheet

City University of Hong Kong

MSDS

YEAST

0553

PRODUCT INFORMATION

Product Name: YEAST

Chinese Name: 酵母

RISK SYMBOL

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PHYSICAL DATA

Boiling Point: No data

Vapor Pressure: No data

Specific Vapor Density: No data

Specific Gravity: No data

Liquid Density: No data

Percent Volatiles: No data

Evaporation Rate: No data

Appearance: No data

City University of Hong Kong

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State: SOLID
Physical Form: GRANULAR
Color: No data
Odor: No data
pH: No data

FIRE AND EXPLOSION DATA

Flash Point: Not applicable
Explosive Limit: Not applicable
Autoignition Temperature: No data
Hazardous Products of Combustion: No data
Fire and Explosion Hazards: Organic dusts can form explosive mixtures in air.
Extinguishing Media: regular foam, water fog, carbon dioxide, sand.
Fire Fighting Instructions:
Wear a self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode with appropriate turn-out gear and chemical resistant personal protective equipment. Refer to the personal protective equipment section of this MSDS.

REACTIVITY DATA

Hazardous Polymerization: Product will not undergo hazardous polymerization.
Hazardous Decomposition: No data
Chemical Stability: Stable.
Incompatibility: No data

HEALTH HAZARD DATA

Potential Health Effects:
Eye: Dust can cause eye irritation. Symptoms include stinging, tearing, redness, and swelling of eyes.
Skin: Unlikely to cause skin irritation or injury.
Swallowing: Swallowing this material is not likely to be harmful.
Inhalation:
This material is a dust or may produce dust. Breathing small amounts of this material is not likely to be harmful.

Symptoms of Exposure: No data
Target Organ Effects: No data
Developmental Information:
There are no data available for assessing risk to the fetus from maternal exposure to this material.

Cancer Information: There is no information available.

Other Health Effects:

This material can form dust which may cause skin or mucous membrane irritation. Symptoms may include redness, burning, and swelling. Although they may cause respiratory tract irritation, nuisance dusts do not form scar tissue or affect the structure of air spaces in the lungs. Their effects on the tissues are potentially reversible.

The above information is believed to be accurate to the best of our knowledge.
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Primary Route(s) of Entry: Inhalation, Skin contact, Eye contact.

FIRST AID MEASURES

Eyes:

If symptoms develop, immediately move individual away from exposure and into fresh air. Flush eyes gently with water for at least 15 minutes while holding eyelids apart; seek immediate medical attention.

Skin:

First aid is not normally required. However, it is recommended that exposed areas be cleaned by washing with soap and water.

Swallowing: First aid is not normally required. If symptoms develop, seek medical attention.

Inhalation:

If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention. If breathing is difficult, administer oxygen. Keep person warm and quiet; seek immediate medical attention.

Note To Physicians: No data

PREVENTATIVE MEASURES

Eye Protection:

Wear safety glasses in compliance with OSHA regulations. (Consult your safety representative.)

Skin Protection: Wear resistant gloves such as: latex.

Respiratory Protections:

3M Dust respirator No. 8710 or 9900 is recommended or a NIOSH/MSHA jointly approved dust respirator. (See your safety equipment supplier.)

Engineering Controls:

Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below level of overexposure (from known, suspected or apparent adverse effects).

Handling And Storage:

Handling:

Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed. Use good personal hygiene practices. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove soiled clothing and wash before reuse. Shower after work using plenty of soap and water.

Storage: Store in a cool, dry place at 75 degrees F or lower.

ENVIRONMENTAL PROTECTION DATA

Small Spill: Sweep up material for disposal or recovery.

Large Spill: Shovel material into containers. Thoroughly sweep area of spill to clean up any residual material.

The above information is believed to be accurate to the best of our knowledge.
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Material Safety Data Sheet

City University of Hong Kong

MSDS**Aceto-Orcein****0554**

PRODUCT INFORMATION

MSDS Name: Aceto-Orcein Solution

Synonyms: None

Ingredient:

Chemical Name	CAS#
Acetic acid	64-19-7
Orcein	1400-62-0

RISK SYMBOL



PHYSICAL DATA

Physical State: Liquid

Appearance: violet

Odor: Vinegar-like odor.

pH: Acidic.

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The above information is believed to be accurate to the best of our knowledge.
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Vapor Pressure: 11 mm Hg
Vapor Density: 2.07
Evaporation Rate: 0.97 (n-Butyl Acetate=1)
Viscosity: Not available.
Boiling Point: 108°C
Freezing/Melting Point: 0°C
Autoignition Temperature: 800°F (426.67°C)
Flash Point: Not applicable.
NFPA Rating: Not published.
Explosion Limits, Lower: 5.4, Upper: 16
Decomposition Temperature: Not available.
Solubility: Soluble in water.
Specific Gravity/Density: 1.025
Molecular Formula: Mixture
Molecular Weight: 0

FIRE AND EXPLOSION DATA

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Reacts with most metals to form highly flammable hydrogen gas which can form explosive mixtures with air.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.

REACTIVITY DATA

Chemical Stability:

Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid: Incompatible materials, ignition sources, excess heat.

Incompatibilities with Other Materials:

Acetaldehyde;2-aminoethanol;ammonium nitrate; bromine pentafluoride; chlorine trifluoride; chlorosulfonic acid; chromic acid; chromic anhydride+acetic anhydride; diallyl methyl carbinol+ozone; ethylene diamine; ethylamine; hydrogen peroxide; nitric acid; nitric acid+acetone; oleum; perchloric acid; permanganates; phosphorus isocyanate; phosphorus trichloride; potassium hydroxide; potassium-t-butoxide; sodium peroxide;xylene.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

HEALTH HAZARD DATA

The above information is believed to be accurate to the best of our knowledge.
No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Danger! Causes digestive tract burns. Causes respiratory tract burns. May be harmful if absorbed through the skin. Corrosive. Causes eye and skin burns.

Target Organs: None.

Potential Health Effects

Eye:

Causes eye burns. Contact with liquid or vapor causes severe burns and possible irreversible eye damage.

Skin:

Causes skin burns. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. May be harmful if absorbed through the skin.

Ingestion:

May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. Causes severe pain, nausea, vomiting, diarrhea, and shock.

Inhalation: Effects may be delayed. Causes chemical burns to the respiratory tract.

Chronic:

Prolonged or repeated skin contact may cause dermatitis. Repeated inhalation may cause chronic bronchitis. Repeated exposure may cause erosion of teeth.

FIRST AID MEASURES

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation is required (at least 30 minutes).

Skin:

Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.

Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician: Treat symptomatically and

Antidote: None reported.

PREVENTATIVE MEASURES

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Discard contaminated shoes.

Storage:

Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Store in a suitable container in a dry area above the substance's freezing point.

ENVIRONMENTAL PROTECTION DATA

Spills/Leaks:

Absorb spill with inert material, (e.g., Dry sand or earth), then place into a chemical waste container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Aluminum Nitrate Nonahydrate****0555**

PRODUCT INFORMATION

MSDS Name: Aluminum Nitrate Nonahydrate, P.A.

Chinese Name: 硝(V)酸鋁

Synonyms: Aluminum Trinitrate; Nitric Acid Aluminum Salt

CAS#: 7784-27-2

RISK SYMBOL

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PHYSICAL DATA

Physical State: solid

Appearance: colorless or white

Odor: odorless

pH: Acidic in solution.

Vapor Pressure: Not available.

Vapor Density: Not available.

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The above information is believed to be accurate to the best of our knowledge.
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Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 302°F
Freezing/Melting Point: 165°F
Autoignition Temperature: Not applicable.
Flash Point: Not applicable.
NFPA Rating: (est.) Health: 2; Flammability: 0; Reactivity: 1
Explosion Limits, Lower: Not available. Upper: Not available.
Decomposition Temperature: 302°F
Solubility: 64% in water at 25°C
Specific Gravity/Density: >1
Molecular Formula: $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$
Molecular Weight: 375.1168

FIRE AND EXPLOSION DATA

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Strong oxidizer. Contact with combustible materials may cause a fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Use water with caution and in flooding amounts. Containers may explode when heated.

Extinguishing Media:

Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out. For small fires DO NOT use dry chemicals, carbon dioxide, halon or foams. USE WATER ONLY. For large fires, flood fire area with water from a distance.

REACTIVITY DATA

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid:

Incompatible materials, ignition sources, dust generation, combustible materials, reducing agents, exposure to moist air or water.

Incompatibilities with Other Materials: Reducing agents, moisture.

Hazardous Decomposition Products:

Nitrogen oxides, irritating and toxic fumes and gases, aluminum oxide, aluminum fumes.

Hazardous Polymerization: Has not been reported.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

The above information is believed to be accurate to the best of our knowledge.
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Appearance: colorless or white.

Danger! Strong oxidizer. Contact with other material may cause a fire. Hygroscopic. May cause reproductive effects based upon animal studies. May cause severe eye, skin and respiratory tract irritation with possible burns.

Target Organs: No data found.

Potential Health Effects

Eye:

Causes eye irritation. May cause conjunctivitis. May cause permanent corneal pacification.

Skin: May cause severe irritation and possible burns.

Ingestion:

Methemoglobinemia is characterized by dizziness, drowsiness, headache, breath shortness, cyanosis with bluish skin, rapid heart rate and chocolate-brown colored blood. Ingestion of nitrate containing compounds can lead to methemoglobinemia. May cause nausea, vomiting, and diarrhea, possibly with blood.

Inhalation:

May cause respiratory tract irritation. May cause methemoglobinemia, cyanosis, convulsions, tachycardia, dyspnea, and death. Methemoglobinemia is characterized by dizziness, drowsiness, headache, breath shortness, cyanosis with bluish skin, rapid heart rate and chocolate-brown blood. May cause acute pulmonary edema, asphyxia, chemical pneumonitis, and upper airway obstruction caused by edema.

Chronic:

May cause methemoglobinemia, which is characterized by chocolate-brown colored blood, headache, weakness, dizziness, breath shortness, cyanosis, rapid heart rate, unconsciousness and possible death. Reproductive effects have been reported in animals.

Carcinogenicity: Aluminum Nitrate Nonahydrate - Not listed by ACGIN, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No information available.

Teratogenicity: No information available.

Reproductive Effects: No information available.

Neurotoxicity: No information available.

Mutagenicity: No information available.

Other Studies: See actual entry in RTECS for complete information.

FIRST AID MEASURES

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. Get medical aid if cough or other symptoms appear. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician:

For methemoglobinemia, administer oxygen alone or with Methylene blue depending on the methemoglobinemia concentration in the blood.

Antidote:

Methylene blue, alone or in combination with oxygen is indicated as a treatment in nitrite induced methemoglobinemia.

PREVENTATIVE MEASURES

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear a chemical apron. Wear appropriate clothing to prevent skin exposure.

Respirators:

Wear a NIOSH/MSHA or European Standard EN 149 approved full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with clothing and other combustible materials. Do not get on skin or in eyes. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. Do not store near combustible materials. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from flammable liquids. Store protected from moisture.

ENVIRONMENTAL PROTECTION DATA

Spills/Leaks:

Vacuum or sweep up material and place into a suitable disposal container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment

section. Avoid generating dusty conditions. Remove all sources of ignition. Do not use combustible materials such as paper towels to clean up spill.

Material Safety Data Sheet

City University of Hong Kong

MSDS

Chlorine Water

0556

PRODUCT INFORMATION

MSDS Name: Chlorine Water-Saturated Solution

Chinese Name: 氯水

Synonyms: None

CAS# 7782-50-5

RISK SYMBOL



PHYSICAL DATA

Physical State: Liquid

Appearance: pale-yellow liquid

Odor: chlorine-like

pH: 1.734

Vapor Pressure: Not available.

Vapor Density: Not available.

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The above information is believed to be accurate to the best of our knowledge.
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Evaporation Rate: >1 (ether=1)
Viscosity: Not available.
Boiling Point: Decomposes.
Freezing/Melting Point: 32°F
Autoignition Temperature: Not applicable.
Flash Point: Not applicable.
NFPA Rating: Not published.
Explosion Limits, Lower: Not available. Upper: Not available.
Decomposition Temperature: Not available.
Solubility: Soluble in water.
Specific Gravity/Density: 1.02
Molecular Formula:
Molecular Weight: 0

FIRE AND EXPLOSION DATA

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.

REACTIVITY DATA

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, combustible materials.

Incompatibilities with Other Materials:

Strong oxidizing agents, strong reducing agents, active metals, ammonia, organic matter.

Hazardous Decomposition Products: Hydrogen chloride, hydrogen gas.

Hazardous Polymerization: Has not been reported.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

Appearance: pale-yellow liquid.

Danger! Harmful if inhaled. Corrosive. Causes eye and skin burns. Causes digestive and respiratory tract burns.

Target Organs: None.

Potential Health Effects

Eye:

Causes eye burns. May cause irreversible eye injury. May cause painful sensitization to light. May cause conjunctivitis.

Skin: Causes skin burns. May cause photosensitization in certain individuals.

Ingestion:

May cause circulatory system failure. Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract.

Inhalation:

Harmful if inhaled. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. May cause pulmonary edema and severe respiratory disturbances.

Chronic:

Prolonged or repeated skin contact may cause dermatitis. Repeated exposure may cause erosion of teeth. May cause conjunctivitis and photosensitization.

Carcinogenicity: Chlorine - ACGIN: A4 - Not Classifiable as a Human Carcinogen

Epidemiology: No information available.

Teratogenicity: No information available.

Reproductive Effects: No information available.

Neurotoxicity: No information available.

Mutagenicity: No information available.

Other Studies: No data available.

FIRST AID MEASURES

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation is required (at least 30 minutes).

Skin:

Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing in a manner which limits further exposure. Remove contaminated clothing and shoes.

Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician: Treat symptomatically and

Antidote: None reported.

PREVENTATIVE MEASURES

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale.

Storage:

Keep away from heat and flame. Do not store near combustible materials. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

ENVIRONMENTAL PROTECTION DATA

Spills/Leaks:

Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Provide ventilation.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Copper chromite****0557**

PRODUCT INFORMATION

MSDS Name: Copper chromite, barium promoted

Chinese Name: 鉻(VI)酸銅(II)

Synonyms: Copper chromite; Chromium (III) copper (II) oxide.

CAS# :12053-18-8

RISK SYMBOL



PHYSICAL DATA

Physical State: Powder

Appearance: black

Odor: Not available.

pH: Not available.

Vapor Pressure: Not available.

Vapor Density: Not available.

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Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: (est.) Health: 1; Flammability: 0; Reactivity: 0
Explosion Limits, Lower: Not available. Upper: Not available.
Decomposition Temperature:
Solubility:
Specific Gravity/Density:
Molecular Formula:
Molecular Weight:

FIRE AND EXPLOSION DATA

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Substance is noncombustible.

Extinguishing Media:

In case of fire use water spray, dry chemical, carbon dioxide, or appropriate foam.

REACTIVITY DATA

Chemical Stability:

Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid: Incompatible materials, dust generation, excess heat.

Incompatibilities with Other Materials: Reducing agents.

Hazardous Decomposition Products: Nature of decomposition products unknown..

Hazardous Polymerization: Has not been reported

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

Appearance: black.

Warning! Causes respiratory tract irritation. May be harmful if absorbed through the skin. May cause digestive tract irritation. May be harmful if swallowed. Causes eye and skin irritation. May cause sensitization by inhalation and by skin contact.

Target Organs: Kidneys, heart, liver, spleen, lungs, gastrointestinal system, bone marrow, nerves.

Potential Health Effects

Eye: Causes eye irritation. May cause chemical conjunctivitis.

Skin: Causes skin irritation. May be harmful if absorbed through the skin.

Ingestion:

May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May be harmful if swallowed.

Inhalation:

Causes respiratory tract irritation. Can produce delayed pulmonary edema. May cause irritation of the mucous membranes. Exposure to chromate salts has been reported to produce nasal and skin ulcerations.

Chronic: Effects may be delayed.

Carcinogenicity: Copper chromite, barium promoted - Not listed by ACGIN, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No information available.

Teratogenicity: No information available.

Reproductive Effects: No information available.

Neurotoxicity: No information available.

Mutagenicity: No information available.

Other Studies: No data available.

FIRST AID MEASURES

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:

Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

PREVENTATIVE MEASURES

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Handling:

Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation. Use with adequate ventilation. Wash clothing before reuse.

Storage:

Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

=====
ENVIRONMENTAL PROTECTION DATA
=====

Spills/Leaks:

Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty conditions. Provide ventilation.

Material Safety Data Sheet

City University of Hong Kong

MSDS

Iron Pyrites

0558

PRODUCT INFORMATION

MSDS Name: Iron Pyrites

Chinese Name: 黃鐵礦

Synonyms: Pyrite; iron pyrite; Iron (II) disulfide; Fool's gold

CAS# : 1309-36-0

RISK SYMBOL

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PHYSICAL DATA

Physical State: Solid

Appearance: pale yellow

Odor: odorless

pH: Not available.

Vapor Pressure: Negligible.

Vapor Density: Not available.

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Evaporation Rate: Negligible.
Viscosity: Negligible.
Boiling Point: Decomposes.
Freezing/Melting Point: 2140°F
Autoignition Temperature: Not applicable.
Flash Point: Not applicable.
NFPA Rating: Not published.
Explosion Limits, Lower: Not available. Upper: Not available.
Decomposition Temperature: Not available.
Solubility: Insoluble in water
Specific Gravity/Density: 4.95-5.20
Molecular Formula: FeS₂
Molecular Weight: 119.967

FIRE AND EXPLOSION DATA

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.

Extinguishing Media:

For small fires, use water spray, dry chemical, carbon dioxide or chemical foam.

REACTIVITY DATA

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Moisture, exposure to air, strong oxidants.

Incompatibilities with Other Materials: Strong acids.

Hazardous Decomposition Products: Oxides of sulfur, hydrogen sulfide.

Hazardous Polymerization: Has not been reported.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

Appearance: pale yellow.

Caution! The toxicological properties of this material have not been fully investigated. May cause irritation.

Target Organs: None.

Potential Health Effects

Eye: Dust may cause mechanical irritation.

Skin: May cause skin irritation.

Ingestion:

May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated.

Inhalation:

May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated.

Chronic:

Repeated exposure may increase iron levels in the liver, spleen and lymphatic system. Damage may occur in the spleen and liver.

Carcinogenicity: Pyrite - Not listed by ACGIN, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No data available.

Teratogenicity: No data available.

Reproductive Effects: No data available.

Neurotoxicity: No data available.

Mutagenicity: No data available.

Other Studies: No data available.

FIRST AID MEASURES

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:

Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.

Antidote: None reported.

PREVENTATIVE MEASURES

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Handling:

Wash hands before eating. Use with adequate ventilation. Avoid contact with skin and eyes. Avoid ingestion and inhalation.

Storage: Store in a cool, dry, well-ventilated area away from incompatible substances.

ENVIRONMENTAL PROTECTION DATA

Spills/Leaks:

Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Cresol****0559**

PRODUCT INFORMATION

MSDS Name: Cresol, Tech.

Chinese Name: 甲酚

Synonyms:

3-Methylphenol; m-Hydroxytoluene; m-Cresylic acid; 1-Hydroxy-3-methylbenzene; m-Oxytoluene; 3-Cresol.

CAS# :1319-77-3

RISK SYMBOL



PHYSICAL DATA

Physical State: Not available.

Appearance: clear amber red

Odor: Not available.

pH: Not available.

City University of Hong Kong

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No responsibilities or liabilities are assumed or implied by CITY U for their inaccuracies.

Vapor Pressure: 1 mm Hg @38-53°C
Vapor Density: 3.7
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Autoignition Temperature: Not available.
Flash Point: 82°C (179.60°F)
Explosion Limits, Lower: Not available. Upper: Not available.
Decomposition Temperature:
Solubility: Partially soluble.
Specific Gravity/Density: 1.0400g/cm³
Molecular Formula: C₇H₈O
Molecular Weight: 108.14

FIRE AND EXPLOSION DATA

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray.

REACTIVITY DATA

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: High temperatures, light, ignition sources, excess heat.

Incompatibilities with Other Materials:

Strong acids, bases, aliphatic amines, oxidizing agents (strong, e.g. Bromine, hydrogen peroxide, nitrogen dioxide, potassium nitrate), chlorosulfonic acid, oleum.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

Appearance: clear amber red. Flash Point: 82°C.

Danger! Combustible liquid. May be harmful if absorbed through the skin. Corrosive. Hygroscopic. Light sensitive. Air sensitive. May be harmful if swallowed. May cause central nervous system effects. Causes eye and skin burns. Causes digestive and respiratory tract burns. May cause liver and kidney damage.

Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye:

Causes eye burns. May result in corneal injury. May cause conjunctivitis and keratitis.

Skin:

Causes severe skin irritation and burns. May be harmful if absorbed through the skin.

Ingestion:

May cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns. May cause liver and kidney damage. May be harmful if swallowed. May cause central nervous system depression, convulsions, coma, and possible death due to respiratory paralysis.

Inhalation:

Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. May cause effects similar to those described for ingestion.

Chronic:

Prolonged or repeated skin contact may cause dermatitis. May cause liver and kidney damage. May cause digestive tract disturbances. Repeated exposure may cause central nervous system damage.

Carcinogenicity: Cresol, Tech - Not listed by ACGIN, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No data available.

Teratogenicity: No data available.

Reproductive Effects: No data available.

Neurotoxicity: No data available.

Mutagenicity: No data available.

Other Studies: No data available.

FIRST AID MEASURES

Eyes: Get medical aid immediately. Extensive irrigation is required (at least 30 minutes).

Skin:

Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing in a manner which limits further exposure. Destroy contaminated shoes.

Ingestion:

Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen.

Notes to Physician: Treat symptomatically and

PREVENTATIVE MEASURES

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well ventilated area. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Discard contaminated shoes.

Storage:

Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Corrosives area.

ENVIRONMENTAL PROTECTION DATA

Spills/Leaks: Absorb spill with inert material, (e.g., Dry sand or earth), then place into a chemical waste container.

Material Safety Data Sheet

City University of Hong Kong

MSDS**1,3-Dinitrobenzene****0560**

PRODUCT INFORMATION

MSDS Name: 1,3-Dinitrobenzene, 98% (GC)
Chinese Name: 1,3-二硝基苯
Synonyms: 2,4-dinitrobenzene; Binitrobenzene.
CAS# : 99-65-0

RISK SYMBOL



PHYSICAL DATA

Physical State: Solid
Appearance: colorless to light yellow
Odor: None reported.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.

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Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 310°C
Freezing/Melting Point: 90°C
Autoignition Temperature: Not applicable.
Flash Point: 302°F (150.00°C)
NFPA Rating: (est.) Health: 2; Flammability: 1; Reactivity: 0
Explosion Limits, Lower: Not available. Upper: Not available.
Decomposition Temperature: Not available.
Solubility: Slightly soluble in water.
Specific Gravity/Density: 1.36801.368
Molecular Formula: C₆H₄N₂O₄
Molecular Weight: 168.039

FIRE AND EXPLOSION DATA

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media: Use foam, dry chemical, or carbon dioxide.

REACTIVITY DATA

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, dust generation.

Incompatibilities with Other Materials: Oxidizing agents, reducing agents, and strong bases.

Hazardous Decomposition Products:

Nitrogen oxides, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Hazardous Polymerization: Has not been reported.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

Appearance: colorless to light yellow.

Warning! Cancer suspect agent. Harmful if swallowed. Methemoglobin forming agent. May cause severe eye irritation and possible injury. May cause liver and kidney damage. Causes digestive and respiratory tract irritation. May cause severe skin irritation. May cause reproductive and fetal effects. May cause cancer based on animal studies. May cause cyanosis with bluish skin. Material is shock sensitive and potentially explosive.

Target Organs: Blood, kidneys, liver, reproductive system.

Potential Health Effects

Eye: Causes severe eye irritation. May cause eye injury. Effects may be delayed.

Skin: Causes severe skin irritation. Absorption into the body may cause cyanosis.

Ingestion:

Harmful if swallowed. Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause liver and kidney damage. May cause cyanosis.

Inhalation: Causes respiratory tract irritation. May cause effects similar to those described for ingestion.

Chronic:

May cause liver and kidney damage. May cause cancer according to animal studies. May cause reproductive and fetal effects.

Carcinogenicity: 1,3-Dinitrobenzene - Not listed by ACGIN, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No data available.

Teratogenicity: No data available.

Reproductive Effects: No data available.

Neurotoxicity: No data available.

Mutagenicity: No data available.

Other Studies: No data available.

FIRST AID MEASURES

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:

Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Induce vomiting by giving one teaspoon of Syrup of Ipecac.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician: Treat symptomatically and

PREVENTATIVE MEASURES

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Handling:

Wash thoroughly after handling. Wash hands before eating. Remove contaminated clothing and wash before reuse. Use only in a well ventilated area. Avoid contact with skin and eyes. Avoid ingestion and inhalation.

Storage: Store in a cool, dry place. Store in a tightly closed container.

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ENVIRONMENTAL PROTECTION DATA

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Spills/Leaks:

Vacuum or sweep up material and place into a suitable disposal container. Reduce airborne dust and prevent scattering by moistening with water. Clean up spills immediately, observing precautions in the Protective Equipment section.

Material Safety Data Sheet

City University of Hong Kong

MSDS

Pyrogallol Solution Alkaline

0561

PRODUCT INFORMATION

MSDS Name: Pyrogallol/Pyrogallate Absorption Stable Solution Alkaline

Chinese Name: 焦棓酚, 連苯三酚

Synonyms: None known.

Ingredient :

Chemical Name	CAS#
Pyrogallol	87-66-1
Potassium Hydroxide	1310-58-3

RISK SYMBOL



PHYSICAL DATA

Physical State: Liquid

Appearance: clear to slightly turbid

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Odor: odorless
pH: 12.0 (0.1 M sol.)
Vapor Pressure: 2.6 mm Hg @ 20 C
Vapor Density: >1.0
Evaporation Rate: Not available.
Viscosity: 3.7 cP
Boiling Point: 271-293°F
Freezing/Melting Point: 48°F
Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: Not published.
Explosion Limits, Lower: Not available. Upper: Not available.
Decomposition Temperature: Not available.
Solubility: Completely soluble in water
Specific Gravity/Density: 1.51
Molecular Formula: Solution
Molecular Weight: 0

FIRE AND EXPLOSION DATA

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products. Use extinguishing media appropriate to the surrounding fire. Substance is noncombustible. Use water with caution and in flooding amounts. Contact with moisture or water may generate sufficient heat to ignite nearby combustible materials.

Extinguishing Media:

Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. In case of fire use water spray, dry chemical, carbon dioxide, or appropriate foam.

REACTIVITY DATA

Chemical Stability:

Stable at room temperature in closed containers under normal storage and handling conditions. May discolor on exposure to air. Air sensitive Light sensitive.

Conditions to Avoid:

Incompatible materials, light, dust generation, exposure to air, acids, metals, excess heat.

Incompatibilities with Other Materials:

Strong oxidizing agents, oxidizing agents, strong reducing agents, strong acids, bases, acid chlorides, potassium permanganate, acid anhydrides, alkalies, iron salts, antipyrine, iodine, air, camphor, menthol, ammonium hydroxide.

Hazardous Decomposition Products:

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Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, oxides of potassium.

Hazardous Polymerization: Has not been reported

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

Appearance: clear to slightly turbid.

Danger! Corrosive. Light sensitive. Air sensitive. Possible risk of irreversible effects. May cause liver and kidney damage. Causes eye and skin irritation. Causes digestive and respiratory tract irritation. May cause blood abnormalities. May be harmful if swallowed, inhaled, or absorbed through the skin. Possible sensitizer.

Target Organs: Blood, kidneys, liver, respiratory system, skin.

Potential Health Effects

Eye:

May cause irreversible eye injury. Contact may cause ulceration of the conjunctiva and cornea. Eye damage may be delayed.

Skin:

Causes severe skin irritation. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. May be harmful if absorbed through the skin. Contact with skin may cause discoloration and eczema. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.

Ingestion:

Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause circulatory system failure. May cause perforation of the digestive tract. May be harmful if swallowed. May cause systemic effects. Rapidly absorbed from the gastrointestinal tract. Ingestion may cause weakness, muscular incoordination, fine tremors, loss of reflexes, convulsions and possible death from circulatory collapse.

Inhalation:

May cause methemoglobinemia, cyanosis, convulsions, tachycardia, dyspnea, and death. Irritation may lead to chemical pneumonitis and pulmonary edema. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. Aspiration may lead to pulmonary edema. May be harmful if inhaled. May cause systemic effects. May be absorbed through the lungs.

Chronic:

Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis. May cause liver and kidney damage. Absorption into the body leads to the formation of methemoglobin which in sufficient concentrations causes cyanosis. Effects may be delayed. Pyrogallol has a tremendous affinity for oxygen of the blood and may cause death by respiratory failure.

Carcinogenicity:

Pyrogallol - Not listed by ACGIN, IARC, NIOSH, NTP, or OSHA.

Potassium Hydroxide - Not listed by ACGIN, IARC, NIOSH, NTP, or OSHA.

Epidemiology:

Subcutaneous, rat: TDLo = 3950 mg/kg/58W-I (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - Tumorigenic - tumors at site of application).

Teratogenicity:

Oral, rat: TDLo = 3 gm/kg (female 6-15 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., Stunted fetus)

Reproductive Effects:

Oral, rat: TDLo = 3 gm/kg (female 6-15 day(s) after conception) Fertility - post-implantation mortality (e.g. Dead and/or resorbed implants per total number of implants).; Subcutaneous, rat: TDLo = 5 mg/kg (female 1 day(s) pre-mating) Maternal Effects - ovaries, fallopian tubes.

Neurotoxicity: No information available.

Mutagenicity:

Micronucleus Test: Intraperitoneal, mouse = 252 mg/kg.; Micronucleus Test: Oral, mouse = 504 mg/kg.; Cytogenetic Analysis: Intraperitoneal, mouse = 100 umol/kg.; Sister Chromatid Exchange: Hamster, Lung = 25 umol/L.; Cytogenetic Analysis: Hamster, Ovary = 100 mg/L.

Other Studies:

Standard Draize test Administration onto the skin: 2 mg/24H (Severe). Standard Draize Test: Administration into the eye (rabbit) = 20 mg/24H (Moderate).

FIRST AID MEASURES

Eyes:

Get medical aid. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation is required (at least 30 minutes).

Skin:

Get medical aid. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing in a manner which limits further exposure.

Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:

Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, or respiratory function may be more susceptible to the effects of this substance. Absorption of this product into the body may cause cyanosis. Moderate degrees of cyanosis need to be treated only by supportive measures: bed rest and oxygen inhalation. For methemoglobinemia, administer oxygen alone or with Methylene blue depending on the methemoglobinemia concentration in the blood.

PREVENTATIVE MEASURES

The above information is believed to be accurate to the best of our knowledge.
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Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Use with adequate ventilation. Store protected from light. Handle under an inert atmosphere. Store protected from air. Discard contaminated shoes.

Storage:

Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from strong acids. Corrosives area. Do not expose to air. Absorbs oxygen from the air and will darken upon exposure. Store protected from light. Store under an inert atmosphere.

ENVIRONMENTAL PROTECTION DATA

Spills/Leaks:

Absorb spill with inert material, (e.g., Dry sand or earth), then place into a chemical waste container. Neutralize spill with a weak acid such as vinegar or acetic acid. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation. Place under an inert atmosphere.

Material Safety Data Sheet

City University of Hong Kong

MSDS**Thymol Blue 0.1% MeOH****0562****PRODUCT INFORMATION**

MSDS Name: Thymol Blue 0.1% MeOH

Chinese Name: 百里酚藍

Synonyms: None

Ingredients

Chemical Name	CAS#
Methanol	67-56-1
Thymol blue	76-61-9

RISK SYMBOL**PHYSICAL DATA**

Physical State: Liquid

Appearance: not available

Odor: None reported

City University of Hong Kong

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pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: Not published.
Explosion Limits, Lower: Not available. Upper: Not available.
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density: Not available.
Molecular Formula: Solution
Molecular Weight: 0

FIRE AND EXPLOSION DATA

General Information:

Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Flammable Liquid. Can release vapors that form explosive mixtures at temperatures above the flashpoint.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective.

REACTIVITY DATA

Chemical Stability:

Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid: High temperatures, incompatible materials, ignition sources.

Incompatibilities with Other Materials:

Oxidants (such as barium perchlorate, bromine, chlorine, hydrogen peroxide, lead perchlorate, perchloric acid, sodium hypochlorite). Active metals (such as potassium and magnesium). Substance is also incompatible with specific chemicals including: acetyl bromide, alkyl aluminum salts, beryllium dihydride, carbon tetrachloride + metals, chloroform + heat, chloroform + sodium hydroxide, cyanuric chloride, diethyl zinc, nitric acid, and potassium tertbutoxide. Please refer to the NFPA Fire Protection Guide for all specifics.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, formaldehyde.

Hazardous Polymerization: Has not been reported.

HEALTH HAZARD DATA

EMERGENCY OVERVIEW

Appearance: not available.

Danger! Flammable liquid. Harmful if inhaled. This substance has caused adverse reproductive and fetal effects in animals. May cause central nervous system depression. May be absorbed through the skin. May cause kidney damage. Poison! May cause respiratory and digestive tract irritation. May cause cardiac disturbances. Cannot be made non-poisonous. Causes eye and skin irritation. May be fatal or cause blindness if swallowed.

Target Organs: Kidneys, central nervous system, liver, cardiovascular system, eyes.

Potential Health Effects

Eye: Causes moderate eye irritation. Vapors may cause eye irritation. May cause painful sensitization to light.

Skin: May cause skin irritation. May be absorbed through the skin in harmful amounts.

Ingestion:

May be fatal or cause blindness if swallowed. May cause irritation of the digestive tract. May cause respiratory failure. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause vascular collapse and damage. May cause kidney failure.

Inhalation:

May cause respiratory tract irritation. May cause liver and kidney damage. May cause adverse central nervous system effects including headache, convulsions, and possible death. May cause visual impairment and possible permanent blindness. May cause effects similar to those described for ingestion.

Chronic:

Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation and ingestion may cause effects similar to those of acute inhalation and ingestion. May cause reproductive and fetal effects.

Carcinogenicity:

Methanol - Not listed by ACGIN, IARC, NIOSH, NTP, or OSHA.

Thymol blue - Not listed by ACGIN, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No information available.

Teratogenicity:

Effects on Newborn: behaviorial, orl-rat TDLo=7500 mg/kg. Embryo or Fetus: fetotoxicity, TCLo=10000 ppm/7H

Specific Developmental Abnormalities: cardiovascular, musculoskeletal, urogenital, TCLo=20000 ppm/7H.

Reproductive Effects: Paternal Effects: spermatogenesis, ipr-mouse TDLo= 5 g/kg.

Neurotoxicity: No information available.

Mutagenicity:

DNA Damage: orl-rat 10 umol/kg. DNA Inhibition: human lymphocyte 300mmol/L. Microbial Mutation w/o S9: S. cerevisiae 12 pph.

Other Studies: None.

FIRST AID MEASURES

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed.

Skin:

Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately. Induce vomiting by giving one teaspoon of Syrup of Ipecac.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Effects may be delayed. Ethanol may inhibit methanol metabolism.

PREVENTATIVE MEASURES

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use only under a chemical fume hood.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves and clothing to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Do not ingest or inhale. Use only in a chemical fume hood. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances.

ENVIRONMENTAL PROTECTION DATA

The above information is believed to be accurate to the best of our knowledge.
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Spills/Leaks:

Scoop up with a nonsparking tool, then place into a suitable container for disposal. Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Provide ventilation.

Material Safety Data Sheet

City University of Hong Kong

MSDS

ALBUSTIX

0563

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PRODUCT INFORMATION

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Part Number/Trade Name: Albustix

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RISK SYMBOL

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PHYSICAL DATA

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Appearance And Odor: Small square paper pad fastened to plastic strip.
Solubility In Water: Not soluble
pH: N/A

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FIRE AND EXPLOSION DATA

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Flash Point: None
Lower Explosive Limit: N/A
Extinguishing Media: Use whatever is required for surrounding area.
Special Fire Fighting Proc: Use NIOSH approved SCBA & full protective equipment (fp n).
Unusual Fire And Expl Hazrds: None identified.

REACTIVITY DATA

Stability: Yes
Cond To Avoid (Stability):
This product is stable as sold if used as directed. There are no specific conditions to avoid.

Materials To Avoid: None specified by manufacturer.
Hazardous Decomp Products: None specified by manufacturer.
Hazardous Poly Occur: No
Conditions To Avoid (Poly): Not relevant

HEALTH HAZARD DATA

LD₅₀-LC₅₀ Mixture: None specified by manufacturer.
Route Of Entry - Inhalation: No
Route Of Entry - Skin: No
Route Of Entry - Ingestion: Yes
Health Haz Acute And Chronic:
This product is not considered to be a critical hazard to man or environment.
Acute: Inhalation, skin contact and eye contact: should not cause any health concerns.
Ingestion: If ingestion should occur patient may feel uncomfortable. Treat as indicated.
Chronic: No chronic effects of overexposure are currently known.

Carcinogenicity - NTP: No
Carcinogenicity - IARC: No
Carcinogenicity - OSHA: No
Explanation Carcinogenicity: Not relevant
Med Cond Aggravated By Exp: None specified by manufacturer.

FIRST AID MEASURES

Emergency/First Aid Proc:
Inhal: Remove to fresh air. Support breathing(give o₂/artf resp) (fp n). Eyes: Immediately flush w/potable water for a minimum of 15 minutes, seek assistance from md (fp n).
Skin: Flush w/copious amounts of water. Call md (fp n).
Ingest: Have patient drink 2-8 oz glasses of water or milk to dilute & contact md for further care.

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PREVENTATIVE MEASURES

Respiratory Protection:

NIOSH approved respirator appropriate for exposure of concern (fp n). There is no respiratory protection required.

Ventilation: Use general room ventilation.

Protective Gloves: Impervious gloves (fp n).

Eye Protection: Ansi approved chem workers goggles (fp n).

Other Protective Equipment: Eye wash fountain & deluge shower which meet ANSI design criteria (fp n).

Work Hygienic Practices: None specified by manufacturer.

Suppl. Safety & Health Data: None specified by manufacturer.

Precautions-Handling/Storing: Store at temperature & conditions as indicated on product labels.

Other Precautions: See product label or package insert for instructions on handling strips during test use.

ENVIRONMENTAL PROTECTION DATA

Steps If Matl Released/Spill:

Sweep up or pick up & place in a disposable container. Ecological effects of product strips have not been determined.

Material Safety Data Sheet

City University of Hong Kong

MSDS**EOSIN Y ALCOHOLIC****0564**

PRODUCT INFORMATION

Product Name: Eosin Y alcoholic

Chinese Name: 曙紅

Ingredients

Chemical name	CAS Number
METHYL ALCOHOL	67-56-1
EOSIN Y	548-26-5
ACETIC ACID	64-19-7

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Orange-pink liquid with fluorescent green cast. Characteristic methanol odor.

Boiling Point: 160°F, 71°C

Melting Point: Unknown

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Vapor Pressure (mm Hg/70 F): Unknown

Vapor Density (Air=1): >1

Specific Gravity: 0.86

Decomposition Temperature: Unknown

Evaporation Rate And Ref: Unknown

Solubility In Water: Complete

Corrosion Rate (IPY): Unknown

FIRE AND EXPLOSION DATA

Flash Point: 72.0°F, 22.2°C

Flash Point Method: OC

Lower Explosive Limit: Unknown

Upper Explosive Limit: Unknown

Extinguishing Media:

Small fires: dry chemical, carbon dioxide. Large fires: alcohol type foam. Do not use ordinary foam.

Special Fire Fighting Proc:

Use self-contained breathing apparatus to prevent exposure to products of combustion. Water fog/spray will aid in keeping fire-exposed containers cool.

Unusual Fire And Expl Hazrds:

Combustion or heat of fire may produce hazardous decomposition products and vapors. Vapors heavier than air. Can travel along ground and flashback.

REACTIVITY DATA

Stability: Yes

Cond To Avoid (Stability): High heat, open flames and other sources of ignition such as sparks.

Materials To Avoid: Strong alkali or acids will alter the staining characteristics of this solution.

Hazardous Decomp Products: Carbon monoxide, carbon dioxide, incompletely burned carbon products.

Hazardous Poly Occur: No

Conditions To Avoid (Poly): Not applicable

HEALTH HAZARD DATA

LD₅₀-LC₅₀ Mixture: LD₅₀ ORAL RAT IS > 3530 mg/kg

Route Of Entry - Inhalation: Yes

Route Of Entry - Skin: Yes

Route Of Entry - Ingestion: No

Health Haz Acute And Chronic:

Acute: eye and skin irritation. Absorption through skin causes toxic effects. Respiratory tract irritation, central nervous system effects. Ingestion may cause central nervous system effects, visual disturbances and possibly death.

Chronic: none specified by manufacturer.

Carcinogenicity - NTP: No

Carcinogenicity - IARC: No

Carcinogenicity - OSHA: No

Explanation Carcinogenicity:

None of the ingredients in this product is listed by NTP, IARC or OSHA as a carcinogen.

Signs/Symptoms Of Overexp: Eyes: irritation. Skin: irritation, dryness.

Inhalation: Narcosis. Ingestion: dizziness, headaches, visual disturbances, Possibly death.

Med Cond Aggravated By Exp:

Individuals with a history of eye, skin and respiratory disorders may be at increased risk from exposure.

FIRST AID MEASURES

Emergency/First Aid Proc:

Eyes: Flush with plenty of water for at least 15minutes.

Skin: Wash with mild soap and water while removing contaminated clothing and shoes.

Inhalation: Remove victim to fresh air. Give oxygen/CPR if needed.

Ingestion: Contact poison center and obtain medical attention immediately.

PREVENTATIVE MEASURES

Respiratory Protection:

None normally required with adequate ventilation. NIOSH/MSHA-approved respirator as appropriate for exposure of concern.

Ventilation: Mechanical (general) ventilation. Use explosion-proof equipment.

Protective Gloves: Rubber gloves.

Eye Protection: Chemical safety goggles.

Other Protective Equipment:

Protective clothing as required to minimize exposure from prolonged or repeated contact. Eye bath and safety shower.

Work Hygienic Practices:

Wash thoroughly after handling and before eating. Launder contaminated clothing before reuse.

Suppl. Safety & Health Data: None.

Precautions-Handling/Storing:

Store containers in areas approved for flammables. Do not handle or store near heat, sparks, flames or strong oxidants. Keep containers closed.

Other Precautions: Avoid eye and skin contact. Do not breathe vapors.

ENVIRONMENTAL PROTECTION DATA

Steps If Matl Released/Spill:

Eliminate all sources of ignition. Soak up small spills with paper towels. Evaporate in a fume hood and burn the paper.

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Material Safety Data Sheet

City University of Hong Kong

MSDS**HYDROGEN CYANIDE AMPULE****0565**

PRODUCT INFORMATION

Part Number/Trade Name: Hydrogen cyanide ampule

Chinese Name: 氰化氫

Ingredient: Hydrocyanic acid; (hydrogen cyanide)

CAS Number: 74-90-8

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Colorless gas with almond odor.

Boiling Point: Supp data

Vapor Pressure (mm Hg/70°F): N/A

Specific Gravity: 1 (H₂O=1)

Evaporation Rate And Ref: Not applicable

Solubility In Water: Slight

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FIRE AND EXPLOSION DATA

Flash Point: None

Lower Explosive Limit: None

Upper Explosive Limit: None

Extinguishing Media: Suitable for surrounding fire.

Special Fire Fighting Proc:

Firefighters should wear SCBA units to protect against possible toxic decomposition products.

Unusual Fire And Expl Hazards:

Fire encompassing the ampules will emit toxic fumes of cyanides and NO_x.

REACTIVITY DATA

Stability: Yes

Cond To Avoid (Stability): None specified by manufacturer.

Materials To Avoid:

Incompatibles incl lithium, oxidizers, and alkaline matls. Under certain cndtns HCN cntct w/strong alkaline (supp data)

Hazardous Decomp Products: When heated to decomposition will emit cyanides and NO_x.

Hazardous Poly Occur: No

Conditions To Avoid (Poly): Not relevant

HEALTH HAZARD DATA

Signs/Symptoms Of Overexp:

Hydrogen cyanide: very tox & capable of entering the body through skin, by inhal or orally. A proplasmic poison, HCN combines in body tissues w/enzymes assoc. w/cellar oxidation. There it renders O₂ unvail to its & (supp data)

FIRST AID MEASURES

Emergency/First Aid Proc:

Eye:

Flush eyes mimed w/copious amts of water for @ St 15 min. Consult MD. Watch for sumps of cyanide poisoning.

Skin: Flush affected areas w/a lot of water. Consult MD. Watch for signs of cyanide poisoning.

Inhal:

Remove to fresh air. Restore/support brthg as nec. Get med help. Observe for symps of cyanide poisoning. For uncon victims, have a trained person admin amyl nitrite perles. (ing 6)

PREVENTATIVE MEASURES

Respiratory Protection:

No respiratory protection is required for normal ampule use. NIOSH/MSHA approved respirator appropriate for exposure of concern (fp n).

Ventilation: Local exhaust or lab fume hood is adequate.

Protective Gloves: Safety gloves.

Eye Protection: ANSI apprvd chem work (other prot equip) goggles w/full fshld (fp n)

Work Hygienic Practices:

None specified by manufacturer. Matls can rslt in explo. Efts of overexp:can cause death due to asphy. Suspension of tiss oxidation lasts only while the cyanide is present; upon its removal normal function is restored provided death has not already occurred. Exposures of 100-200 ppm for (ing 3)

Precautions-Handling/Storing:

Store in the original container in a cool dry place. Protect from light, heat and physical damage.

Other Precautions:

Do not breathe calibration gas. Avoid cuts from broken glass ampules. Wash hands prior to eating, drinking, smoking and applying cosmetics after product use.

ENVIRONMENTAL PROTECTION DATA

Steps If Matl Released/Spill:

Provide adequate ventilation. Ampules contain only 10 cc of dilute HCN. Calibration gas may be vented to atmosphere. Avoid cuts from broken glass ampules.

Material Safety Data Sheet

City University of Hong Kong

MSDS

LYSOL BRAND LIQUID

0566

PRODUCT INFORMATION

Product Name: Lysol brand liquid disinfectant(supdat)

Chinese Name: 來蘇兒

Ingredient:

Chemical name	CAS Number
FORMALDEHYDE	50-00-0
HYDROCHLORIC ACID	7647-01-0
ISOPROPYL ALCOHOL	67-63-0
STYRENE	100-42-5

RISK SYMBOL



PHYSICAL DATA

Appearance And Odor: Blue-green opaque liquid w/wintergreen odor.

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Specific Gravity: 1.047
Evaporation Rate And Ref: <1 (BUTYL ACETATE=1)
Solubility In Water: COMPLETE
pH: <1

FIRE AND EXPLOSION DATA

Flash Point: >200°F,>93°C
Flash Point Method: TCC
Extinguishing Media:
Use water spray, foam, dry chemical or carbon dioxide, as suitable for the surrounding fire.
Special Fire Fighting Proc: Use NIOSH/MSHA approved SCBA & full protective equipment.
Unusual Fire And Expl Hazards: NONE KNOWN.

REACTIVITY DATA

Stability: Yes
Cond To Avoid (Stability): None known.
Materials To Avoid: Do not use w/chlorine bleach or any other chemical products. Fumes are corrosive to metal.
Hazardous Decomp Products: May evolve small amounts of hydrochloric acid fumes.
Hazardous Poly Occur: No
Conditions To Avoid (Poly): Not relevant

HEALTH HAZARD DATA

LD₅₀-LC₅₀ Mixture: None specified by manufacturer.
Route Of Entry - Inhalation: Yes
Route Of Entry - Skin: Yes
Route Of Entry - Ingestion: Yes
Health Haz Acute And Chronic:
Inhal: Vapors may be irritating to respiratory tract.
Skin: Product is corrosive, produces chemical burns.
Eyes: This product is corrosive. Contact could result in permanent injury.
Ingest:
May be harmful or fatal if swallowed. May cause damage to membranes of mouth, throat & gi tract. Matl is corr to (efst of overexp)
Carcinogenicity - NTP: No
Carcinogenicity - IARC: No
Carcinogenicity - OSHA: No
Explanation Carcinogenicity: Not relevant
Signs/Symptoms Of Overexp: Hlth haz: mucosa of above tissues.
Med Cond Aggravated By Exp:

None expected during normal use patterns of product. However, pre-existing lung disorders may be exacerbated during use.

FIRST AID MEASURES

Emergency/First Aid Proc:

Inhal: Remove to fresh air.

Skin: wash thoro w/soap & lg qtys of water.

Eye:

Immed flush thoro w/water, remove any contact lenses & continue to flush w/plenty of water for at lst 15 mins. Get prompt med attn.

Ingest:

Do not induce vomit. Call md immed. Drink lg Qtys of water, followed by several tablespoonfuls of milk of magnesia/egg Whites. Never give anything by mouth to unconscious person.

PREVENTATIVE MEASURES

Respiratory Protection:

NIOSH/MSHA approved respirator appropriate for exposure of concern (fp n). None required.

Ventilation: None required.

Protective Gloves: Impermeable gloves.

Eye Protection: ANSI approved chem workers (supp data)

Other Protective Equipment: Emergency eye wash & deluge shower meeting

Ansi design standards (fp n).

Work Hygienic Practices: None specified by manufacturer.

Precautions-Handling/Storing:

Store in original cntnr in areas inaccessible to small children. Keep out of reach of children. Do not breathe vap/fumes. Fumes are corr to metal.

Other Precautions:

Corr - prdces chem burns. Contains hydrochloric acid. Do not get in eyes, on skin/on clthg. May be harmful/fatal if swallowed. This prod is a registered pesticide. Use of this prod in a manner not consistent w/lbl instructions is a (supdat)

ENVIRONMENTAL PROTECTION DATA

Steps If Matl Released/Spill:

Concentrated matl should be contained, collected & evaluated for disp according to state & fed haz waste regs.

Undiluted/concentrated matl should not be flushed to sewer. This prod contains hydrochloric acid which is subject to reporting (supp data)