

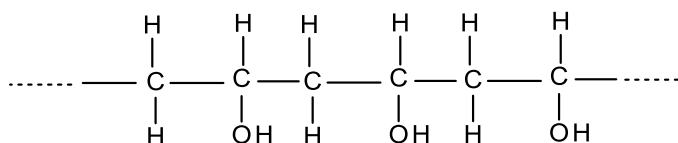
Preparation of “Slime”

Objective

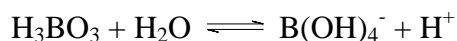
- To prepare a slime using polyvinyl alcohol (PVA) and borax
- To study the properties of the slime prepared

Background

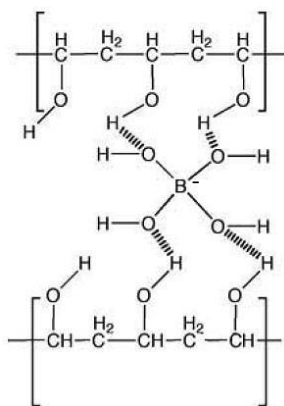
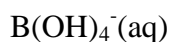
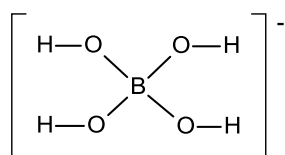
Slime can be prepared by adding borax solution to an aqueous solution of polyvinyl alcohol (PVA). The structure of PVA is as follows:



Borax is sodium tetraborate, $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$. It dissolves in water to form boric acid, H_3BO_3 . H_3BO_3 will accept OH^- from water to give $\text{B}(\text{OH})_4^-(\text{aq})$.



$\text{B}(\text{OH})_4^-(\text{aq})$ is responsible for the cross-links between PVA polymer chains.



Slime

Curriculum links

Chemistry:

Topic V Fossil Fuels and Carbon Compounds

Topic VI Microscopic World II

Topic X Chemical equilibrium

Safety precautions

- Wear safety glasses and disposable plastic gloves.
- Keep the slime away from clothes as it can produce permanent stains.
- Hands should be washed at the end of the experiment.

Chemicals and apparatus (per group)

Polyvinyl alcohol (PVA), 4% aqueous solution, 100 cm³

Sodium tetraborate (Borax), 4% aqueous solution, 10 cm³

Dilute hydrochloric acid, about 0.5 M, 10 cm³

Dilute sodium hydroxide, about 0.5 M, 10 cm³

50 cm³ measuring cylinder (x 1)

Plastic cup (x 2)

Wooden stick (x 1)

Water-based felt-tipped pen (x 1)

Organic solvent-based felt-tipped pen (x 1)

Transparency / plastic sheet (x 1)

Disposable plastic gloves

Procedures

Preparing the slime

1. Add 100 cm³ of the 4% PVA to a polystyrene cup and record its appearance.
2. Add 5 cm³ of the 4% sodium tetraborate solution to the cup slowly and stir the mixture immediately with the wooden stir stick. Make a record of observations as the reaction proceeds.
3. Within a couple of minutes the slime will be formed. Lift some of it out with the wooden stick and record your observations.
4. Wear a pair of disposable gloves and remove the slime from the cup. Knead it for thorough mixing. Roll the slime around in your hand, gently squeezing the material to remove air bubbles at the same time.

Testing the properties of slime

5. Record the observations for each of the following steps with the gloves on.
 - (a) Pull the slime apart slowly.
 - (b) Pull the slime apart sharply and quickly.
 - (c) Roll the slime into a ball and drop it on to the bench.
 - (d) Place a small bit of slime on the bench and hit it hard with your hand.
 - (e) Press firmly the slime onto some writings written on a plastic sheet using a water-based felt-tipped pen and then lift up the slime.
 - (f) Press firmly the slime onto some writings written on a plastic sheet using an

organic solvent-based felt-tipped pen and then lift up the slime.

6. Place a very small piece of slime in a plastic cup and carry out the following steps and record the observations.
 - (a) Add the dilute hydrochloric acid dropwise, stirring well after each drop. When you notice a change, record the number of drops added and your observations.
 - (b) Add dilute sodium hydroxide solution to the same sample used above in (a), stirring after each drop. When you notice a change, record the number of drops added and your observations.
 - (c) Repeat the above tests and see if the same results will be obtained.

Results

	Observations
Appearance of PVA before sodium tetraborate solution is added (step 1)	
Changes in the mixture of PVA and sodium tetraborate solution in the process of mixing (step 2)	
Pulling the slime slowly (steps 3 and 5(a))	
Pulling the slime quickly (step 5(b))	
Dropping the slime on to the bench (step 5(c))	
Hitting the slime hard on the bench (step 5(d))	
Pressing firmly the slime on writings (steps 5(e) and 5(f))	
Adding dilute HCl(aq), then adding NaOH(aq) (steps 6(a) and 6(b))	

5. Explain the observations of pressing and then lifting the slime from the words written with water-based pen and organic solvent-based pen.

6. Explain the observations of adding HCl(aq) and then adding NaOH(aq) to the slime.
