Professional Development Programme on Enriching Knowledge of the Chemistry Curriculum for Chemistry Teachers (2021-2023)

Topics: Clean and Sustainable Fuels for Transportation: A Chemical Perspective

Speaker: Professor LEE, Hung Kay
Department of Chemistry
The Chinese University of Hong Kong

Objectives:

1. To provide an overview on worldwide development of various types of sustainable energy;
2. To introduce the science of sustainable energy from a chemical perspective;
3. To enrich teachers' knowledge on the principles and latest development of new generation lithium-ion batteries, hydrogen and fuel cells, solar cells and biofuels in the transportation sector; and
4. To introduce the current developments and implementations of clean and sustainable fuels for vehicles in Mainland.

Abstract: Transportation plays an irreplaceable role in human society. It enables communication, cultural exchange and economic growth. Today, the energy consumption in various transport sectors (road, rail, sea and air) is still overwhelmingly relying on fossil fuels, which generate various environmental issues with air pollution problems in particular. Therefore, the development of clean, sustainable and low-carbon transportation fuels has attracted considerable attention in the past decades. In this lecture, we will discuss the latest development of clean and sustainable fuels for transportation, including the chemistry of new generation lithium-ion batteries, hydrogen and fuel cells, solar cells, and bioenergy. In addition, the current development and implementations of clean and sustainable fuels for passenger and commercial vehicles in Mainland will be highlighted.

Suggested reading materials:

1. Energy use for transportation
   https://www.eia.gov/energyexplained/use-of-energy/transportation.php
2. Sustainable transportation
   https://www.energy.gov/eere/sustainable-transportation
3. Energy for transport: 8% from renewable sources
   https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20200123-2
4. Alternative energy for transportation
   https://issues.org/omi/
5. Running on Renewables: Transforming Transportation through Renewable Technologies
   https://irena.org/newsroom/articles/2018/Jan/Running-on-renewables-transforming-transportation-through-renewable-technologies
6. Leo Petrus and Minke A. Noordermeer, Biomass to Biofuels, A Chemical Perspective. *Green Chemistry* (2006), p.861-867.
7. Sarah O'Meara, China's Plan to Cut Coal and Boost Green Growth. *Nature* (2020), vol. 584, p.S1-S3.
8. 新能源汽车产业发展规划（2021 – 2035 年）
   http://www.gov.cn/zhengce/content/2020-11/02/content_5556716.htm
9. 中国新能源公交车推广应用经验
   https://www.efchina.org/Attachments/Report/report-ctp-20210325/中国新能源公交车推广应用经验.pdf

高中化學科及組合科學科（化學部分）課程

知識增益系列（2021-2023）

主題： **從化學角度認識各類潔淨及永續能源在交通運輸領域的發展**

講者： 香港中文大學　化學系

李鴻基教授

目標：

1. 概述全球各類永續能源的發展情況；
2. 從化學角度介紹永續能源科學；
3. 增進教師對新一代鋰離子電池、氫能及燃料電池、太陽能電池和生物燃料的認識及其在交通運輸領域的最新發展；以及
4. 介紹內地用於汽車的潔淨及永續能源的發展及實踐。

摘要：交通運輸在人類社會中起著無法替代的角色。它促進通訊、文化交流和經濟增長。時至今天，各個運輸領域—公路、鐵路、海運和航空的能源消耗仍然絕大多數依賴化石燃料，這產生了各種環境問題，包括溫室氣體及各類大氣污染物的排放。因此，在過去幾十年中開發潔淨、永續和低碳運輸燃料引起了相當大的關注。在這講座中，我們將討論潔淨及永續能源在交通和運輸的最新發展，包括新一代鋰離子電池、氫能及燃料電池、太陽能電池和生物能源的化學和原理。此外，此講座將介紹內地公用和商用汽車所使用的潔淨和永續能源的近期發展及實踐。

推薦閱讀材料：

1. Energy use for transportation
   https://www.eia.gov/energyexplained/use-of-energy/transportation.php
2. Sustainable transportation
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