Johnson Matthey Plenary Talk: Unlocking the Potential of Catalysis in Clean Energy Generation, Processing and Storage

The generation and provision of energy is a key concern for society. The world's rising population demands increasing amounts of energy for heating, cooling, transport and other uses, driven by the desire for higher living standards. At the same time, the sources of energy used are changing. Fossil fuel reserves are acknowledged as finite and increasingly more complex fossil fuel resources (heavier oils, stranded gas) are developed. However, concerns about air pollution and climate change have led to the view that these fossil resources should not be developed, and that renewable technologies such as solar, wind and biorenewables should be commercialised instead.

Catalysis has many roles to play in the new energy arena. In some applications, catalysis is key in pollution control, especially in transportation. The synthesis of clean fuels also relies on catalysis, both for conventional fuels (diesel by the Fischer Tropsch process) and potential new fuels such as dimethoxymethane or hydrogen. Fuel processing has always needed catalysts, and there are many roles for catalysis in the synthesis and purification of new fuels.

Solar and wind power are increasingly adopted as they are emission-free in service. However, the main drawback of these technologies is that they are intermittent. One way of storing the energy is by the synthesis of chemicals, using the excess electricity as an energy source. In this way, well-established catalytic processes such as methanol synthesis and the water gas shift reaction are being re-imagined in a new context and with new challenges to be overcome.

In this plenary talk we will give an industrial perspective on the status catalysis in energy applications, and the opportunities ahead in this rapidly-developing area.