

Sweet fuel supply

A new type of fuel cell powered with glucose derived from biomass is described in the latest issue of the Inderscience Publication International Journal of Global Energy Issues. The experimental device works by using sunlight to convert the glucose into hydrogen to power the cell, which produces several hundred millivolts.

The use of biological resources, such as food waste and managed high-energy crops, are gradually becoming a viable approach to reducing our reliance on fossil fuels. However, imaginative ways to convert these materials into useful, electrical energy are still required. Renewable biomass resources include starch, cellulose, sucrose, and lactose. These complex sugar molecules can be readily converted to the much simpler glucose molecule with little energy cost through fermentation processes.

The glucose could then be used to release hydrogen using enzymes.

It is this last step that chemists Yutaka Amao and Yumi Takeuchi of Oita University, in Dannoharu, Japan, have focused on to build their glucose-powered fuel cell.

The researchers have built the device with a transparent conductive glass electrode coated with a highly colored molecule that can mimic the natural process of photosynthesis. This molecule is incorporated into light-absorbing titania. The coating can absorb energy from sunlight and release it into another chemical layer on the electrode. This is connected to a platinum electrode and the pair is immersed in a glucose solution to complete the circuit.

When light shines on the light-active electrode enzymes in the chemical layer are triggered to react with glucose molecules in the solution and release hydrogen ions, the dissolved hydrogen ions then attract electrons from the platinum electrode, which causes a current to flow through the wire connecting the electrodes.

Source: Inderscience Publishers

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