Generating hydrogen from biodiesel waste

November 27 2007

Researchers at the University of Leeds have a potential solution to the problem of large quantities of low value by-product generated in the synthesis of biodiesel – by turning it into high value hydrogen.

Biodiesel – motor fuel derived from vegetable oils - is currently considered as a renewable alternative to rapidly depleting hydrocarbon fuels for the transport sector. It is biodegradable and non-toxic, and production has increased enormously over the past few years.

However, for every molecule of biodiesel produced, another of low-value crude glycerol is generated. The disposal of such large quantities of glycerol presents a growing economic and environmental problem to producers - and a disincentive to companies looking to enter the market.

Dr Valerie Dupont and her co-investigators in the University's Faculty of Engineering have developed a novel process that turns glycerol into a hydrogen-rich gas, a high value product in great demand for use in fertilisers, food production and chemical plants. Moreover, hydrogen is itself viewed as a future 'clean' replacement for hydrocarbon-based transport fuels, and most countries currently reliant on these fuels are investing heavily in hydrogen development programmes.

Dr Dupont's process mixes glycerol with steam at controlled temperature and pressure, which separates the different components into hydrogen, water and carbon dioxide, leaving no waste residues. A special absorbent material filters out the carbon dioxide, which leaves a much purer product.

“Hydrogen has been identified as a key future fuel for low carbon energy systems such as power generation in fuel cells and as a transport fuel. Current production methods are expensive and unsustainable, using either increasingly scarce fossil fuel sources such as natural gas, or other less efficient methods such as water electrolysis.”

“Our process is a clean, renewable alternative to conventional methods. It produces something with high value from a low grade waste product for which there are few economical upgrading mechanisms” says Dr Dupont. “In addition, it’s a near ‘carbon-neutral’ process, since the CO2 generated is not derived from the use of fossil fuels.”

Dr Dupont believes the process is easily scalable to industrial production, and, as the race towards the ‘hydrogen economy’ accelerates, could potentially be an economically important, sustainable – and environmentally friendly – way of meeting the growing demand for hydrogen.

Dr Dupont’s research has been funded with a £270k grant from the EPSRC under its Energy programme, and is in collaboration with Professors Yulong Ding and Mojtaba Ghadiri from the Institute of Particle Science and Engineering, and Professor Paul Williams from the Energy and Resources Research Institute at Leeds. Industrial collaborators are Johnson Matthey and D1-Oils.

Source: University of Leeds