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## New catalyst boosts hydrogen as transport fuel

Scientists have developed a cheaper way to make hydrogen from biofuel that could be a solution to previous difficulties with storage and transport of the gas

**Alok Jha**, green technology correspondent  
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A cheaper way to produce hydrogen from biofuels has been developed, a step that could overcome some of the critical obstacles blocking the gas's widespread future use as a green transport fuel.

Hydrogen is often touted as a transport fuel of the future since it produces only water when it is burned. If the gas is produced from sustainably grown biofuels, its use results in very low carbon emissions. Car manufacturers are already developing vehicles that can run on hydrogen fuel cells but moving to a fully-fledged hydrogen transport system requires solving several key issues. These include how to produce the gas efficiently and transport it, which requires very high pressure containers. Building the infrastructure for consumers to fill their cars with hydrogen is another problem.

Umit Ozkan, a professor of chemical and biomolecular engineering at Ohio State University, has led a team of scientists to develop a catalyst that can make hydrogen from ethanol without the need for high temperatures or expensive materials such as platinum or rhodium. The work could circumvent some of the storage and transportation problems.

"Instead of making hydrogen from biofuel at a centralised facility and transporting it to gas stations, we could use our catalyst inside reactors that are actually located at the gas stations. So we wouldn't have to transport or store the hydrogen – we could store the biofuel, and make hydrogen on the spot." The research was presented on Wednesday at the American Chemical Society's annual meeting in Philadelphia.

Catalysts that can make hydrogen from biofuels already exist but usually need rare, expensive ingredients. "Precious metals have high catalytic activity and, in most cases, high stability, but they're also very expensive," said Ozkan.

She said that her goal from the outset was to develop a cheaper catalyst, one that was based on readily-available metals. The resulting catalyst is made from calcium, cobalt and small grains of cerium oxide, a common ingredient in ceramics. According to the researchers, it can produce hydrogen with 90% efficiency at around 350C – a low temperature by industrial standards. "Rhodium is used most often for this kind of catalyst, and it costs around \$9,000 (£4,800) an ounce," said Ozkan. "Our catalyst costs around \$9 a kilogram."

She added that operating at lower temperatures would also bring energy savings. "And if the catalyst is highly active and can achieve high hydrogen yields, we don't need as much of it. That will bring down the size of the reactor, and its cost".

The production of hydrogen from ethanol produces waste gases such as carbon dioxide and methane – the former can be trapped and stored while the latter can be burned to supply some of the energy needed for the conversion process itself. Though the team's current research focused on ethanol, the researchers believe it could be adapted to other liquid biofuels.

Ozkan said that a preliminary economic analysis of her technique showed that the price of hydrogen could approach that of petroleum. "As gasoline prices continue to rise, hydrogen produced from renewable sources such as bio-liquids will be more and more competitive. Also, the possibility of using hydrogen in fuel cells will provide much higher efficiency than internal combustion engines can. So the actual cost, in dollars per mile, may already be lower."

Friends of the Earth's biofuels campaigner Kenneth Richter warned that hydrogen was only as clean a source of power as the energy used to produce it. "Rather than being a clean alternative to fossil fuels, biofuels are actually increasing carbon dioxide emissions. Hydrogen-fuelled cars are still a long way off – the immediate priority for cutting emissions is smarter cars that burn less fuel."

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