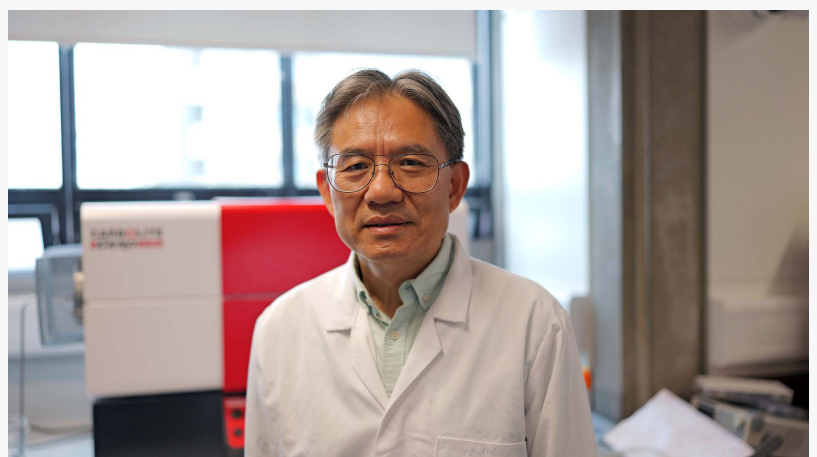


Water splitting catalyst creates hydrogen at low temperatures

Birmingham researchers' novel way of producing hydrogen fuel has a lower cost than existing methods.

BIRMINGHAM, WEST MIDLANDS, UNITED KINGDOM, May 1, 2026 /EINPresswire.com/ -- University of Birmingham research published today has shown a new low-temperature method for producing hydrogen that is suitable for both centralised hydrogen production, and also local generation using waste heat from large-scale industrial plants.



Professor Yulong Ding demonstrated the catalyst thermochemically splits water into hydrogen and oxygen, and can deliver substantial yields.

Hydrogen is the most abundant element in the universe and is a clean and environmentally friendly energy carrier. Unlike fossil fuels, which produce harmful emissions and carbon dioxide, it produces only heat and water on combustion and can also power fuel cells that produce electricity. But while hydrogen is carbon-free at the point of use, 95% of current production relies on fossil fuels.

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A preliminary techno-economic study shows thermochemical splitting with the catalyst is cost-effective compared to the established blue and green pathways for hydrogen production.”

*Professor Yulong Ding,
University of Birmingham*

Thermochemical splitting, where a catalyst splits water into hydrogen and oxygen, is emerging as a promising method for hydrogen production. However current catalysts split water at 700-1000oC and need temperatures between 1300 and 1500 degrees Celsius to regenerate between cycles of water-splitting.

Scientists led by Professor Yulong Ding from the University's School of Chemical Engineering have demonstrated it is possible to reduce the temperature by 500C by using a perovskite catalyst.

Their research, published in the [International Journal of Hydrogen Energy](#), showed the catalyst

can produce substantial yields of hydrogen in a temperature range of 150-500C, and be regenerated at temperatures between 700 and 1000C.

Professor Ding said: “The lower overall temperature of the process could enable hydrogen to be produced nearby renewable energy generation plants, and foundation industry sectors such as steel, cement, glass and chemicals have an abundance of waste heat, which could be harnessed as the heat input for low-temperature hydrogen production. If the hydrogen is used locally, this would overcome the obstacles presented by storage and transport, so enabling the uptake of hydrogen fuel without the need for costly infrastructure.”

A provisional [cost-competitiveness analysis](#) has shown water splitting with the perovskite catalyst can deliver hydrogen at a lower cost than either green hydrogen (produced from water by electrolysis) or blue hydrogen (produced from methane with carbon capture and storage). The cost advantage was most pronounced in regions with low renewable energy tariffs, such as Australia.

The research was conducted during a collaboration with the University of Science and Technology Beijing (USTB) and is being commercialised in the UK and Europe by the University of Birmingham. [University of Birmingham Enterprise](#) has filed a patent application covering the use of BNCF catalysts for splitting water at low temperatures and is currently seeking development partners to advance this promising approach.

Why thermochemical splitting?

Hydrogen is the most abundant element in the universe but is relatively rare on earth in the form of pure hydrogen gas. It is primarily found bound in other molecules, most commonly water and hydrocarbons such as natural gas containing mostly methane, coal or oil. These molecules need to be split into their constituent parts to produce hydrogen.

The most widely used method for hydrogen production involves splitting methane through steam reforming. This accounts for nearly half of H₂ produced today, but produces CO₂ as a byproduct, undermining its potential as carbon-free energy source, unless it is coupled with carbon capture and storage. Electrolysis is a greener method of producing H₂, but it is in competition with the cheaper hydrogen generated by methane splitting, and consequently only delivers ~4% of the H₂ supplied. Photonic methods use light to drive the chemical conversion of water into hydrogen, but are in their infancy, and face significant challenges in efficiency, scalability, and cost-effectiveness.

About the perovskite catalyst

Perovskites are lattice-like materials that can absorb oxygen molecules into their structure, and split oxygen-containing molecules into their constituent parts.

While perovskites come in many forms, the researchers concentrated on those made from barium, niobium, calcium and iron (BNCF perovskites), which are readily available, and do not

require complex synthesis, or contain toxic ingredients.

Their research demonstrated that a BNCF perovskites accepts oxygen into their structures at substantially lower temperatures than previously believed. A perovskite called BNCF100 was found to be the optimum formulation, and the study confirmed the catalyst can be regenerated at lower temperatures than current water-splitting catalysts, and retain its ability to produce hydrogen over 10 cycles of production. X-ray diffraction showed little sign of structural change in the catalyst throughout.

Professor Ding said: "Our research revealed a catalyst capable of produced substantial yields of hydrogen at relatively low temperatures, and a preliminary techno-economic study shows it is cost-effective compared to the established blue and green pathways for hydrogen production."

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