

A chance discovery may revolutionize hydrogen production

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Using a molybdenum based catalyst, hydrogen bubbles are made cheaply and at room temperature. Credit: EPFL / Alain Herzog

Producing hydrogen in a sustainable way is a challenge and production cost is too high. A team led by EPFL Professor Xile Hu has discovered that a molybdenum based catalyst is produced at room temperature, inexpensive and efficient. The results of the research are published online in *Chemical Science* Thursday the 14th of April. An international patent based on this discovery has just been filled.

Existing in large quantities on Earth, water is composed of hydrogen and [oxygen](#). It can be broken down by applying an electrical current; this is the process known as electrolysis. To improve this particularly slow reaction, platinum is generally used as a [catalyst](#). However, [platinum](#) is a particularly expensive material that has tripled in price over the last

decade. Now EPFL scientists have shown that amorphous molybdenum sulphides, found abundantly, are efficient catalysts and hydrogen production cost can be significantly lowered.

Industrial prospects

The new catalysts exhibit many advantageous technical characteristics. They are stable and compatible with acidic, neutral or basic conditions in water. Also, the rate of the hydrogen production is faster than other catalysts of the same price. The discovery opens up some interesting possibilities for industrial applications such as in the area of solar energy storage.

It's only by chance that Daniel Merki, Stéphane Fierro, Heron Vrubel and Xile Hu made this discovery during an electrochemical experience. "It's a perfect illustration of the famous serendipity principle in fundamental research", as Xile Hu emphasizes: "Thanks to this unexpected result, we've revealed a unique phenomenon", he explains. "But we don't yet know exactly why the catalysts are so efficient."

The next stage is to create a prototype that can help to improve sunlight-driven [hydrogen production](#). But a better understanding of the observed phenomenon is also required in order to optimize the catalysts.

More information: Daniel Merki, Stéphane Fierro, Heron Vrubel and Xile Hu, "Amorphous Molybdenum Sulfide Films as Catalysts for Electrochemical Hydrogen Production in Water," *Chemical Science*, 2011.

Provided by Ecole Polytechnique Federale de Lausanne

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