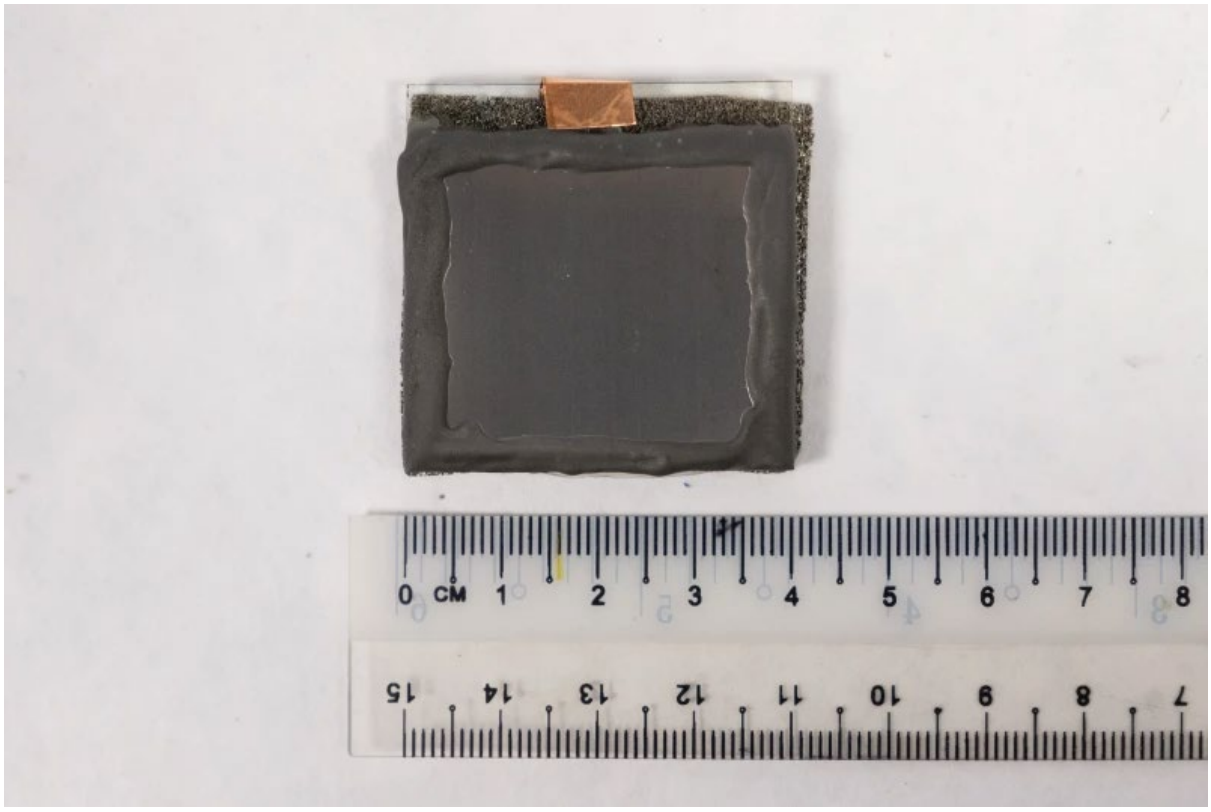
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Nidhi Goyal

Scientists Create a Solar-Powered 'Artificial Leaf' That Produces Hydrogen While Cleaning Polluted Water



Scientists have developed a solar-powered artificial leaf that can produce clean hydrogen fuel from seawater while removing a dangerous industrial pollutant. The device, developed by researchers at Nanyang Technological University (NTU) in Singapore, combines renewable energy production with wastewater treatment in a single system.

Inspired by natural leaves, the technology uses sunlight to generate electricity without requiring an external power supply. The research, published in Nature Communications, could open new possibilities for producing cleaner fuels while tackling water pollution.

One Device Tackles Two Environmental Problems

Hydrogen is attracting growing interest as a clean energy source because it can generate electricity without releasing carbon dioxide during use. However, conventional hydrogen production through water electrolysis requires electricity, while using seawater presents additional challenges.

Saltwater contains chloride ions that can trigger unwanted chemical reactions, produce harmful chlorine compounds and damage equipment.

The artificial leaf takes a different approach. It uses sunlight to power hydrogen production while breaking down hydrazine, a highly toxic chemical found in industrial wastewater. This approach also reduces the energy required for the process.

Sunlight Powers the Hydrogen-Producing System

The device combines a light-absorbing semiconductor with a specially designed catalyst. Its semiconductor uses lead-halide perovskite, a material that converts sunlight into electricity. Protective layers help shield this sensitive material from the harsh aquatic environment.

Meanwhile, the catalyst helps break down hydrazine into nitrogen and hydrogen. This reaction allows the system to generate additional hydrogen while reducing the pollutant's concentration.

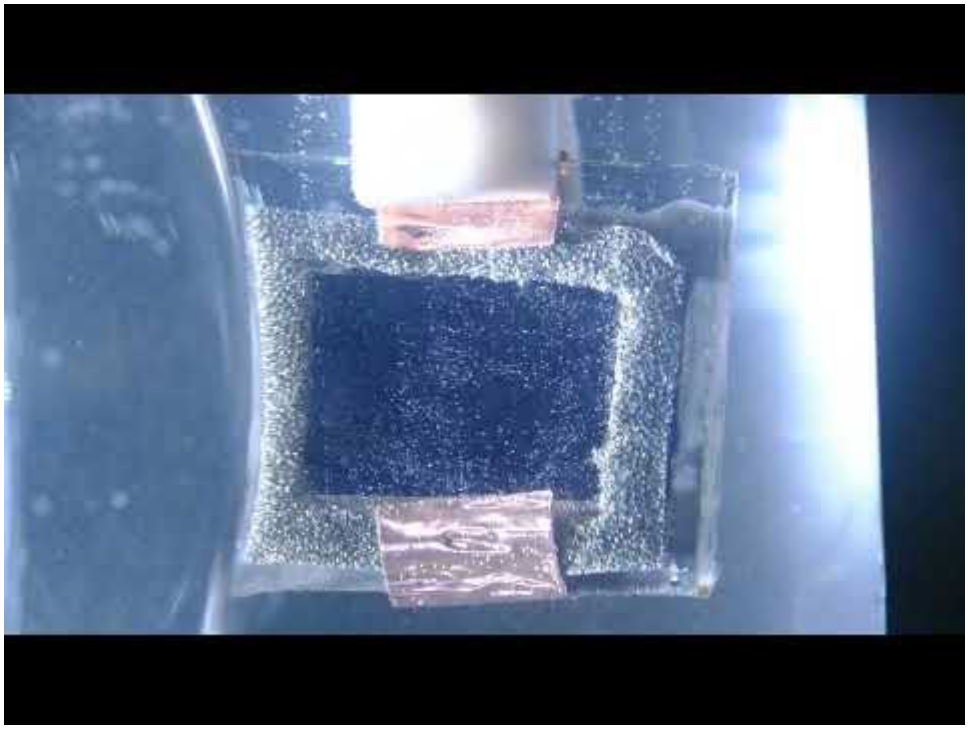
During experiments, the device maintained stable performance for more than 72 hours under sunlight-equivalent illumination. It produced hydrogen at a rate of 466 micromoles per square centimetre per hour.

A Promising Step Towards Cleaner Fuel

In tests using contaminated water, the researchers reduced hydrazine concentrations to below one part per billion within approximately 30 hours.

However, the technology remains at the experimental stage. Researchers must improve its durability, scalability and long-term safety before it can be used commercially.

The team is also exploring ways to adapt the system to remove other pollutants and convert waste materials into useful fuels and chemicals.



https://www.industrytap.com/scientists-create-a-solar-powered-artificial-leaf-that-produces-hydrogen-while-cleaning-polluted-water/81842