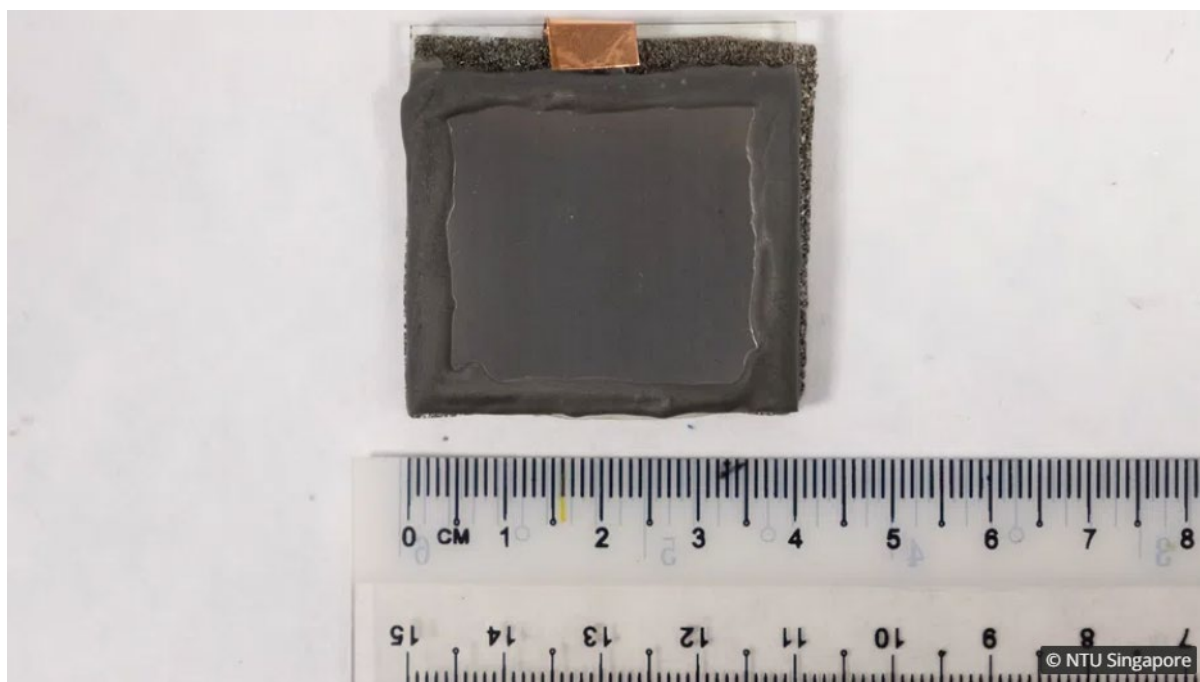


18 September 2026

Translated from Dutch

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### **Generating hydrogen and purifying wastewater: this artificial leaf does both.**

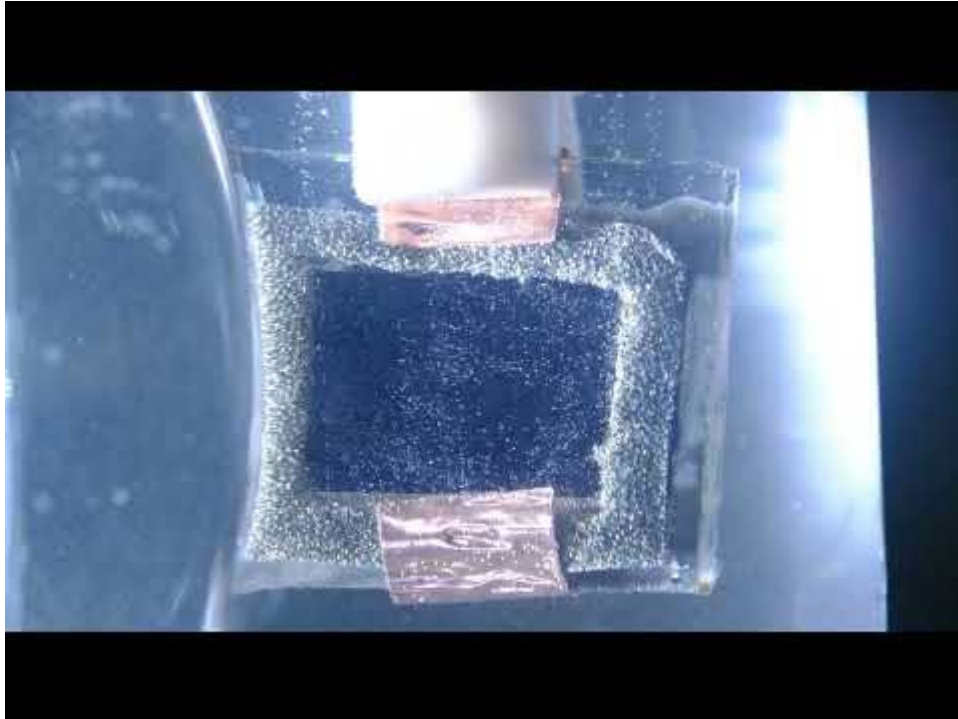
Researchers at Nanyang Technological University (NTU) in Singapore have built an artificial leaf that uses sunlight to produce hydrogen from seawater while simultaneously breaking down a toxic industrial substance. The device requires no external power source: it derives all its energy from light.

To extract hydrogen from water, you pass current through water between two poles. Hydrogen is produced on one side, and oxygen on the other. The oxygen side, in particular, requires a lot of energy. In seawater, an additional problem arises: the salt on that side also reacts, which, combined with the high energy demand, reduces efficiency. This produces chlorine compounds that are toxic and corrode the components.

The researchers circumvent this by not producing oxygen on that side, but by breaking down hydrazine instead. That substance breaks down much more easily into nitrogen and even more hydrogen. That requires less energy. Moreover, hardly any chlorine is produced.

## Toxic substance

Hydrazine is a colorless liquid that is widely used in industry (and often ends up in wastewater afterwards). Power plants use it to extract oxygen from boiler water, spacecraft use it as fuel for their thrusters, and the chemical industry uses it as a raw material for medicines and agricultural products, among other things. The WHO Cancer Agency considers the substance to be probably carcinogenic.



The current for the reaction comes from a layer of perovskite, a crystalline material also found in a new generation of solar cells that converts light into electricity. The device continued to operate stably for three days under light comparable to full sunlight. In the lab, it reduced the amount of hydrazine in about 30 hours from approximately 1.6 percent of the weight of the wastewater to 0.5 parts per billion.

The technology is not yet ready for the market. The perovskite used contains lead, and lead-containing perovskites are known to degrade rapidly in seawater. The researchers therefore protected the material with titanium foil and a conductive resin. They themselves state that real wastewater has a much more complex composition and that systems capable of handling it still need to be developed.

<https://www.bright.nl/nieuws/2137138/dit-kunstmatige-blad-maakt-waterstof-uit-zeewater-en-ruimt-tegelijk-gif-op.html>