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Translated from German

Inspired by nature: “Solar leaf” generates hydrogen and purifies toxic water

A mini-device from Nanyang Technological University extracts hydrogen from seawater and breaks down hydrazine.

A leaf-shaped device inspired by nature, which doesn't look like a leaf, uses sunlight to produce hydrogen: The source of the H2 is seawater; the device simultaneously purifies it of a dangerous industrial toxin. Furthermore, no harmful chloride compounds are produced during operation, unlike what is often the case with seawater electrolysis. This invention by researchers at Nanyang Technological University in Singapore is currently "just a small leaf." The scientists still need to explore the possibilities for scaling it up for large-scale applications. Nevertheless, it's an exciting approach!



Mini device breaks down the industrial pollutant hydrazine

While the solar-powered mini-device extracts hydrogen from seawater, it simultaneously breaks down the pollutant hydrazine. It thus combines a miniature solar cell with an electrolyzer and wastewater treatment. Since seawater typically contains a significant amount of chloride, toxic chlorine compounds can be produced as a

byproduct during conventional electrolysis. However, because the researchers have incorporated a special catalyst containing iron, cobalt, and chromium, this does not occur: The electrodes are corrosion-resistant and suppress the formation of pollutants.

The system does not require an external power supply.

This catalyst is also responsible for hydrazine degradation: it splits the poison into nitrogen gas using significantly less energy than is required for the usual oxygen evolution. The cathode consists of lead halide perovskites. These semiconductors convert sunlight into electrical energy and act as a driver for hydrogen production, entirely without an external power supply. To protect against moisture and chemicals, the researchers coated the sensitive layer with conductive epoxy resin (including silver and copper particles), titanium foil, and a thin layer of platinum.

In tests using simulated and real seawater plus hydrazine under artificial sunlight, the device operated stably for over 72 hours, producing 466 micromoles of hydrogen per square centimeter per hour. A larger version reduced the hydrazine concentration from 0.5 M (approximately 1.6 percent by weight) to 0.5 parts per billion (ppb) within about 30 hours – well below the US limit of 10 ppb. The system also proved effective outdoors under natural sunlight. The researchers hope their invention will soon be able to filter other pollutants – perhaps we'll hear more about this project soon.

https://www.klamm.de/news/inspiriert-von-der-natur-solarblatt-erzeugt-wasserstoff-und-reinigt-giftwasser-26N1201526.html