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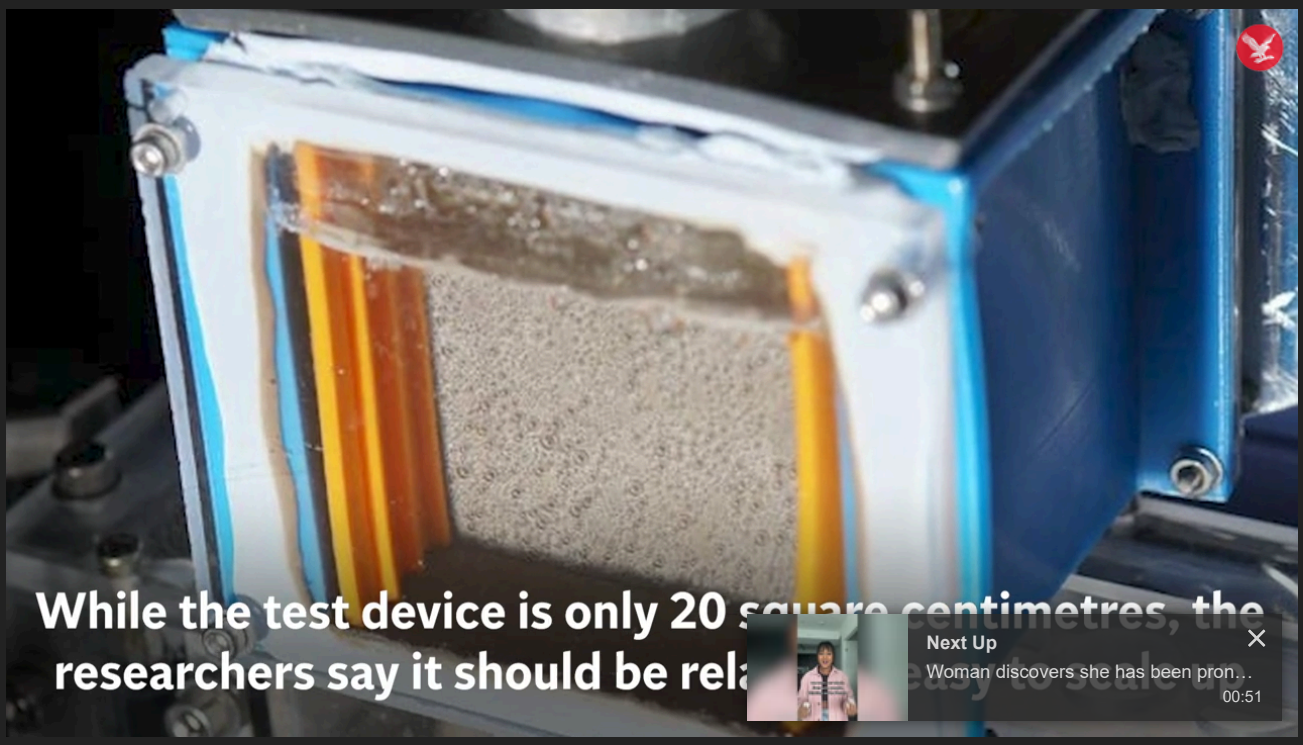
Scientists hail major breakthrough in developing holy grail of renewable energy: artificial photosynthesis

New discovery addresses one of biggest obstacles to artificial photosynthesis – a technology long seen as a potential source of carbon-neutral fuels

Stuti Mishra • Wednesday 27 August 2025 12:08 BST • 1 Comment



Major step towards 'artificial photosynthesis' as device produces clean energy like plants.mp4

Turning sunlight directly into fuel has come closer to reality after scientists developed a molecule that can hold enough energy to mimic the way plants capture light.

The discovery addresses one of the biggest obstacles to artificial photosynthesis – a technology long seen as a potential source of carbon-neutral fuels.

Unlike conventional renewables, which generate electricity, artificial photosynthesis would make fuels that can be stored and used in ships, planes and heavy industry – sectors that are difficult to electrify.

The breakthrough study, published by a team at the University of Basel, shows how a specially designed molecule can store four charges of energy from light – two positive and two negative – in a stable state. Storing multiple charges is essential because most fuel-making reactions, such as splitting water into hydrogen and oxygen, require more than one electron at a time.

Until now, attempts to replicate photosynthesis in the lab have relied on intense laser light far stronger than natural sunlight. The new molecule can hold multiple charges under much dimmer conditions, close to those found outdoors, and keep them stable long enough to be used in chemical reactions such as splitting water into hydrogen and oxygen.