# New technology gives a glimpse of solar fuel generation in action

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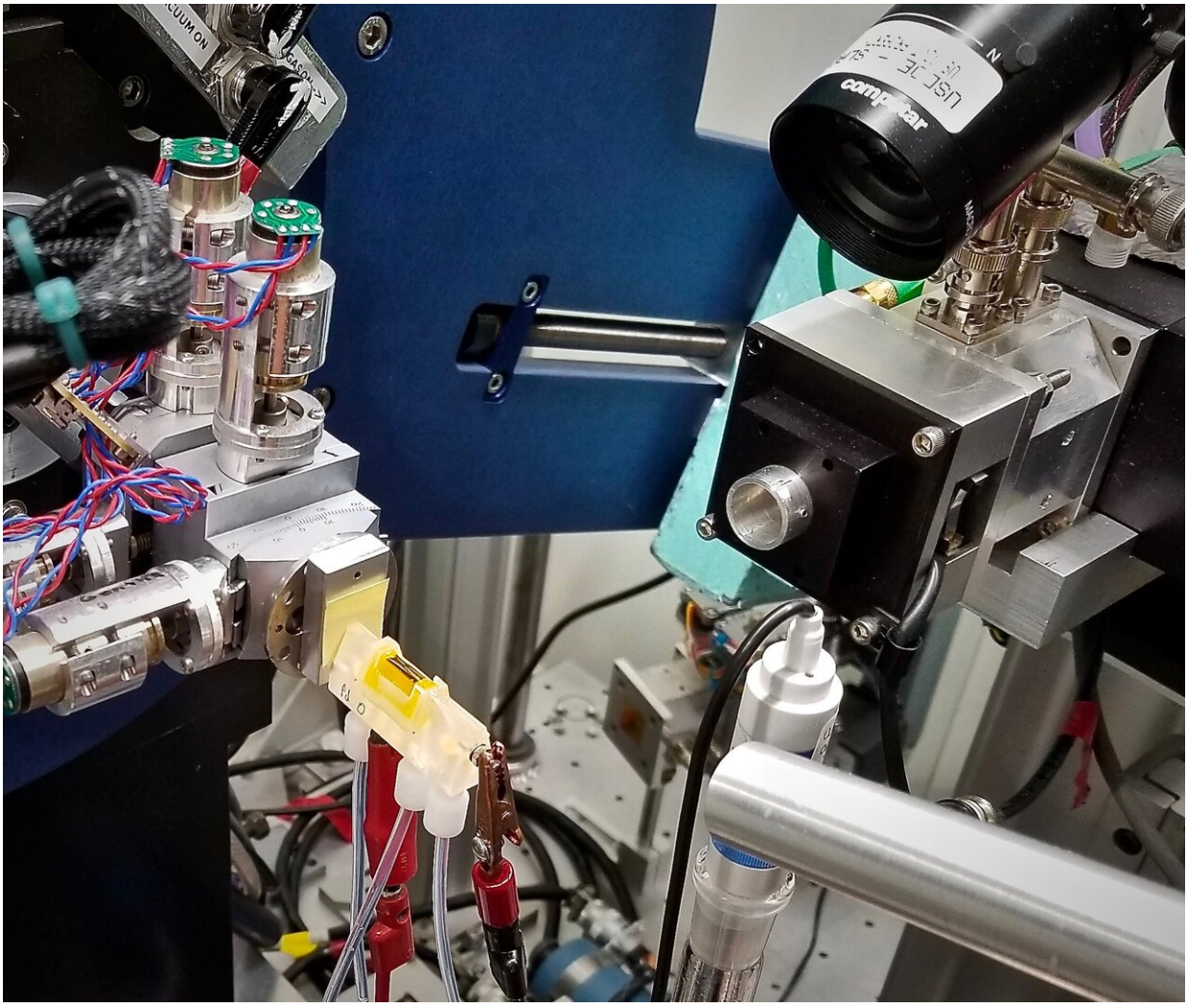

The team's electrochemical cell for observing solar fuel-generating catalysts (yellow device), set up at an x-ray beamline at the Stanford Synchrotron Radiation Lightsource. Credit: Walter Drisdell/Berkeley Lab

Electrochemical devices that use sunlight to generate fuel represent a promising means of harvesting sustainable energy; but currently, none are efficient enough for real-world applications. One of the main reasons for the slow development is the difficulty in observing and measuring what is happening at the liquid-catalyst interface—the location in the cell where the fuel-producing chemical reactions are taking place—without interfering with the processes.

Hoping to break this barrier, scientists at the Joint Center for Artificial Photosynthesis, a Department of Energy Innovation Hub based partly at Berkeley Lab, have invented a cell that is specially designed to allow for unobtrusive observation of an isolated, operating catalyst. A description of the cell is published in *Physical Chemistry Chemical Physics*.

"Our design can mimic how a catalyst behaves in a full device, thanks to a fast-flow design that constantly replenishes the liquid at the interface," said lead author Walter Drisdell, a Berkeley Lab chemist. "And the cell shape allows X-ray beams to graze over the surface, showing us the chemistry at the interface specifically."

The cell is expected to help scientists engineer and test new catalyst materials, which can be used in next-generation solar fuel devices that split water to produce hydrogen gas and convert carbon dioxide emissions into fuels like ethanol.

"We intend to make the cell available to users at the DOE's Stanford Synchrotron Radiation Lightsource (SSRL) facility so the entire science community can benefit from it," said Drisdell. SSRL is a DOE Office of Science user facility.

**More information:** Maryam Farmand et al. Electrochemical flow cell

enabling operando probing of electrocatalyst surfaces by X-ray spectroscopy and diffraction, *Physical Chemistry Chemical Physics* (2019). DOI: 10.1039/C8CP07423B

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