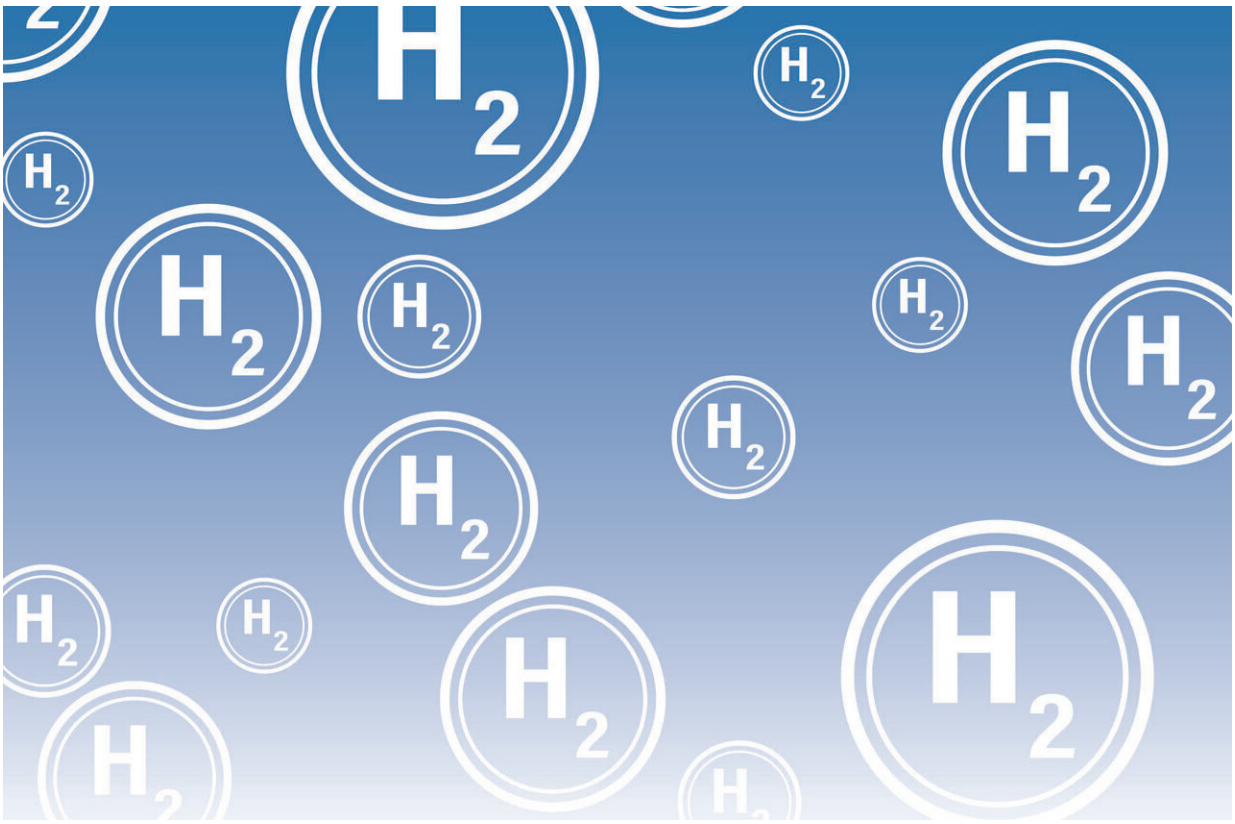
A novel way to store energy from the sun in solution for eventual conversion to hydrogen

February 9 2022, by Bob Yirka



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A team of researchers affiliated with several universities in Germany has developed a novel way to store energy captured from the sun for use in conversion to hydrogen fuel. In their paper published in the journal

Nature Chemistry, the group describes how they produced a molecule capable of holding energy captured from the sun that could then be used later to produce hydrogen fuel.

As solar cell technology has matured, scientists have been busily trying to find a better way to store the energy produced so that it can be used when the sun is not shining. Most current systems use batteries, which most in the field agree is inefficient. Other approaches have involved using the energy from the sun directly to produce hydrogen fuel but doing so involves a lot of expensive storage issues. In this new effort, the researchers have taken a new approach—storing the energy from the sun in molecules where it can be released on demand to create hydrogen fuel.

The work by the team involved creating a compound using a metal oxide that was bonded to dual light-sensitive molecules that were based on ruthenium, a rare metal. The resulting molecules were then added to a solution containing sodium ascorbate. Under such a setup, solar cells are not needed at all, instead light from the sun is directed onto the solution where its energy is captured via electrons from the salt—as it does so, the solution changes from clear to dark blue. Testing showed the liquid was viable for up to 24 hours.

The next phase of the process involves adding an acid (in their case sulfuric) to the solution—in so doing, the electrons combine with hydrogen ions in the acid to produce hydrogen gas which can then be used as a fuel source.

Notably, the energy-holding molecules can be charged and discharged multiple times, though they will degrade over time—thus their recyclability is an issue. The researchers also note ruthenium is very expensive, which means they will need to keep searching for a suitable, less expensive replacement. They conclude by suggesting their work

hints at the possibility of storing energy in a solution as an on-demand hydrogen fuel source in real-world applications.

More information: Sebastian Amthor et al, A photosensitizer–polyoxometalate dyad that enables the decoupling of light and dark reactions for delayed on-demand solar hydrogen production, *Nature Chemistry* (2022). DOI: 10.1038/s41557-021-00850-8

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