

Genetically engineered blood protein can be used to split water into oxygen and hydrogen

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Proteins occurring in the blood have been used to make a molecule that splits water in oxygen and hydrogen

Scientists have combined two molecules that occur naturally in blood to engineer a molecular complex that uses solar energy to split water into hydrogen and oxygen, says research published today in the *Journal of the American Chemical Society*.

This molecular complex can use energy from the sun to create hydrogen gas, providing an alternative to electrolysis, the method typically used to split water into its constituent parts. The breakthrough may pave the way for the development of novel ways of creating hydrogen gas for use as fuel in the future.

Professors Tsuchida and Komatsu from Waseda University, Japan, in

collaboration with Imperial College London, synthesised a large molecular complex from albumin, a protein molecule that is found at high levels in blood serum, and porphyrin, a molecule which is used to carry oxygen around the body and gives blood its deep red colour. Porphyrin molecules are normally found combined with metals, and in their natural state in the blood they have an iron atom at their centre. The scientists modified the porphyrin molecule to swap the iron for a zinc atom in the middle, which completely changed the chemistry and characteristics of the molecule.

This modified porphyrin molecule was then combined with albumin; with the albumin molecule itself being modified by genetic engineering to enhance the efficiency of the process. The resulting molecular complex was proven to be sensitive to light, and can capture light energy in a way that allows water molecules to be split into molecules of hydrogen and oxygen.

Dr Stephen Curry, a structural biologist from Imperial College London's Division of Cell and Molecular Biology who participated in the research explains: "This work has shown that it is possible to manipulate molecules and proteins that occur naturally in the human body by changing one small detail of their make-up, such as the type of metal at the heart of a porphyrin molecule, as we did in this study.

"It's very exciting to prove that we can use these biological structures as a conduit to harness solar energy to separate water out into hydrogen and oxygen. In the long term, these synthetic molecules may provide a more environmentally friendly way of producing hydrogen, which can be used as a 'green' fuel."

Source: Imperial College London

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