Molecular assemblies created to convert water to hydrogen gas

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Wonder where the fuel will come from for tomorrow's hydrogen-powered vehicles? Virginia Tech researchers are developing **catalysts that will convert water to hydrogen gas.**
The research will be presented at the 228th American Chemical Society National Meeting in Philadelphia August 22-26, 2004

Supramolecular complexes created by Karen Brewer's group at Virginia Tech convert light energy (solar energy) into a fuel that can be transported, stored, and dispensed, such as hydrogen gas.
The process has been called artificial photosynthesis, says Brewer, associate professor of chemistry. "Light energy is converted to chemical energy. Solar light is of sufficient energy to split water into hydrogen and oxygen gas, but this does not happen on its own; we need a catalysts to make this reaction occur."

One major challenge is to use light to bring together the multiple electrons needed for fuel production reactions. Electrons are the negatively charged particles that surround an atom's nucleus, allowing atoms to react and form bonds.

Previous research has focused on collecting electrons using light energy. The Brewer group has gone the next step and created molecular machines that use light to bring electrons together (photoinitiated electron collection) then deliver the electrons to the fuel precursor, in this case, water, to produce hydrogen.

The researchers create a large molecular assembly called a supramolecular complex. Light signals this molecular assembly or machine to collect electrons and make them available for delivery to substrates.

Water is readily available and cheap, says Brewer, "but, so far, our compound is expensive. The goal is to make it catalytic and to couple it to oxygen production. We are working to build a supramolecular complex that will initiate the collection and movement of electrons and bonding of atoms without being destroyed in the process, so we don't have to build another molecular machine every time we want to convert water to hydrogen." Our systems do functioning catalytically but the efficiency needs to be enhanced.

Mark Elvington, a graduate student in chemistry, will present the research, "Photochemical reactivity of mixed-metal supramolecular complexes: Applications as photochemical molecular devices," at 9:30 a.m., Wednesday, Aug. 25, at Pennsylvania Convention Center room113A. Co-authors are Brewer, Elvington, and Ran Miao, also a Ph.D. student in chemistry at Virginia Tech from Fudan University.

Source: Virginia Tech