Producing hydrogen from water with carbon / charcoal powder

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In the latest advance in efforts to find an inexpensive way to make hydrogen from ordinary water—one of the keys to the much-discussed "hydrogen economy"—scientists are reporting that powder from high-grade charcoal and other forms of carbon can free hydrogen from water illuminated with laser pulses. A report on the discovery appears in ACS' *Journal of Physical Chemistry C*.

Ikuko Akimoto and colleagues point out that traditional approaches to breaking down water, which consists of hydrogen and oxygen, involve use of expensive catalysts or electric current passed through water. Since economical production of hydrogen from water could foster a transition from coal, oil and other fossil fuels, scientists have been searching for less expensive catalysts. Those materials speed up chemical reactions that otherwise would not work effectively. Based on hints from research decades ago, the scientists decided to check out the ability of carbon powder and charcoal powder, which are inexpensive and readily available, to help split hydrogen gas from oxygen in water.

Akimoto's team tested carbon and charcoal powders by adding them to water and beaming a laser in nanosecond pulses at the mixtures. The experiment generated hydrogen at room temperature without the need for costly catalysts or electrodes. Its success provides an alternative, inexpensive method for producing small amounts of hydrogen from water.

More information: "Hydrogen Generation by Laser Irradiation of

Carbon Powder in Water" *J. Phys. Chem. C*, Just Accepted Manuscript. DOI: 10.1021/jp4012558

Abstract

We report the photochemical activity of carbon powder in the generation of hydrogen from water by laser irradiation, without any electrodes and photocatalysts. The gas was obtained by laser irradiation in the VIS-NIR range and was dependent nonlinearly on the laser power density. From a gas component analysis and a repeated irradiation experiment, it was found that the carbon powder was oxidized and acted as a sacrificial reagent in the photochemical hydrogen generation. In addition, a highly carbonized charcoal, known as Bincho-tan, was found to effectively work for the hydrogen generation.