Method and Electrocatalyst to Efficiently Produce Hydrogen Fuel for Storage of Renewable Energy

INVENTORS • Shannon Stahl, James Gerken

WARF: P100096US01

View U.S. Patent No. 8,192,609 in PDF format.

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method to efficiently produce hydrogen or other fuels from renewable energy sources through catalyzed water-electrolysis.

OVERVIEW

Processes that store renewable energy such as wind or solar energy as chemical fuels have the potential to provide a substitute for fossil fuels and ease civilization's reliance on non-renewable resources. However, technologies that generate hydrogen and oxygen from water currently are so energy inefficient that the process is commercially limited as a means of converting solar energy to hydrogen gas as fuel or chemical feedstock. To drive this electrolysis reaction, a substantial amount of energy over the theoretical minimum required must be provided. This extra energy is known as the overpotential.

Efforts to reduce the overpotential have improved the process, but significant obstacles to commercial use remain, including requirements for elevated temperatures, highly basic environments or expensive catalysts. More efficient water-electrolysis catalysts for the conversion of water to hydrogen and oxygen are needed.

THE INVENTION

UW-Madison researchers have developed an improved catalytic method for generating hydrogen and oxygen gas via water electrolysis. The method uses novel electrocatalysts formed from cobalt, oxygen and fluoride. These unique catalysts result in an electrolysis reaction with a favorable shift in pH tolerance and altered overpotential, making it easier and less expensive to split water into hydrogen and oxygen and providing a more practical means of storing renewable energy.

To drive the electrolysis reactions, electricity can be generated using a renewable energy source such as a solar cell or wind turbine. The hydrogen gas that results from this process can be collected and used as an alternative fuel source for vehicles or other fuel-dependent applications or as a feedstock for conversion into other fuels or materials. The oxygen gas can be collected and used for any process that requires pure oxygen, such as steelmaking.

THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.

APPLICATIONS

- On-site, just-in-time generation of high-purity hydrogen gas
- Storage of renewable energy as hydrogen fuel
- Large scale production or residential generation of hydrogen fuel from renewable resources

KEY BENEFITS

- Easier and less expensive to split water into hydrogen and oxygen via electrolysis
- Improves efficiency by reducing overpotential requirements
- Uses renewable sources – water, solar and wind energy
- Shifts pH level to more favorable reaction conditions than traditional processes
- Functions efficiently at ambient conditions
- Catalysts are stable under strongly oxidizing conditions that occur during electrolysis.
- Cobalt and fluoride are low-cost and abundant materials.

ADDITIONAL INFORMATION

Tech Fields

Clean Technology - Energy & resource efficiencies
Clean Technology - Biofuels & renewable fuels

CONTACT INFORMATION

For current licensing status, please contact Mark Staudt at mstaudt@warf.org or 608-960-9845.