Catalyst enables fuel cells to run on a variety of liquid fuels

OAAT ACCOMPLISHMENTS

Catalytic Autothermal Reforming for Hydrogen Production

Challenge

Automotive fuel cells require hydrogen gas to operate. The most convenient way to obtain the gas would be to use an onboard fuel processor to convert or "reform" commonly available liquid fuels, such as gasoline, methanol, and ethanol, into hydrogen. Finding the right catalyst (a substance that facilitates a chemical reaction) that can reform a variety of liquid fuels into hydrogen in a compact, yet efficient fuel processor is an enormous challenge.

Technology Description

U.S. Department of Energy (DOE) researchers discovered a class of new materials to produce catalysts that facilitate the reforming chemistry required to convert gasoline and other liquid fuels into hydrogen. These catalysts combine materials that dehydrogenate hydrocarbon while oxidizing carbon.

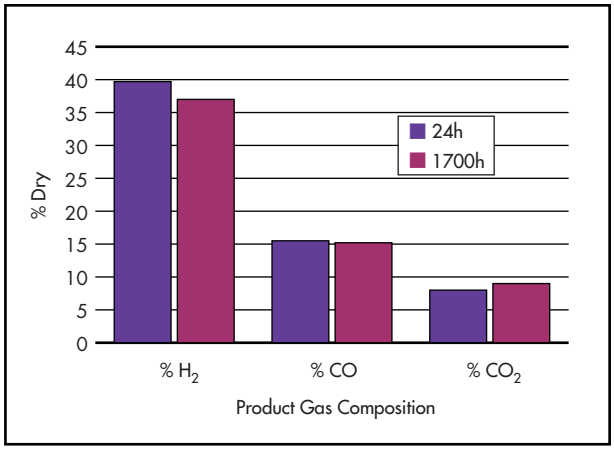
The new catalysts also allow fuel reforming to take place at temperatures hundreds of degrees cooler than noncatalytic processes, which simplifies the fuel processor design and helps minimize undesirable by-products, such as carbon monoxide. Tests also indicate that the catalyst is tolerant of sulfur (a common impurity in fuels) that typically degrades the performance of other catalysts.

Commercialization

Süd-Chemie Inc. (formerly United Catalyst, Inc.) has licensed the reforming catalyst formulation and will develop optimal manufacturing methods with the intent to commercialize the technology.

Accomplishments

Reforming catalysts enhance the performance of fuel processors in fuel cell power systems in vehicles, as well as for stationary applications.



The catalyst has demonstrated the ability to efficiently reform a variety of liquid fuels into hydrogen. This "fuel-flexible" capability makes the catalyst compatible with a wide range of technologies.

Limited long-term tests (1,700 hours) using pelletized forms of the catalyst have shown minimal loss (~5 percent) with fuels containing 50 ppm of sulfur.

Contacts

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Benefits

In the absence of a nationwide hydrogen-refueling infrastructure, onboard reforming of existing liquid fuels, such as gasoline, to provide hydrogen for automotive fuel cells offers significant advantages.

The reforming catalyst technology would help fuel cell vehicles operate on gasoline with near-zero emissions and achieve higher fuel economy with a driving range comparable to conventional gasoline-powered vehicles.

Future Activities

Additional sulfur-tolerance testing using a monolithic configuration should reduce catalyst degradation and extend useful catalyst life.

Partners in Success

- Argonne National Laboratory
- Süd-Chemie, Inc.