



# Methods of Reforming Hydrocarbon Fuels Using Hexaaluminate Catalysts

## Opportunity

Research is currently active on the technology “Methods of Reforming Hydrocarbon Fuels Using Hexaaluminate Catalysts.” The technology is available for licensing and/or further collaborative research from the U.S. Department of Energy’s National Energy Technology Laboratory.

## Overview

This invention discloses a method to reform hydrocarbon fuels using hexaaluminate catalysts. In general, the method successfully disrupts the formation of carbon that leads to the deactivation of the catalyst, a key element in the reforming of hydrocarbon fuels.

When researchers are designing catalysts to reform hydrocarbon fuels, one of the most difficult challenges they face is the deactivation of the catalyst due to carbon deposition. Carbon deposits decrease catalyst activity by blocking active sites. The unwanted result is the attrition of catalyst particles, an increase in pressure drop, and an ultimate discontinuation of the process.

The deposition of carbon onto the catalyst surface occurs by hydrocarbon dehydrogenation on active metallic sites or by cracking on the support material. Carbon deposition on metallic surfaces is a structure-sensitive reaction that begins on the edges of the metal crystallites. Therefore, a method was invented to disperse the active metals in a mixed-metal oxide that has a strong metal-support interaction, such as with hexaaluminate, so that the active metals are maintained in a state of low coordination which serves to disrupt the carbon deposition mechanism.

In this invention, transition metals are directly doped into the structure of the hexaaluminate compound, which is a high-temperature refractory support material. Hexaaluminate, in turn, serves two purposes. It disperses the active metal crystallites, and it also creates a strong metal-support interaction that prevents metallic crystallites from aggregating, sintering, and vaporizing.

## Patent Details

U.S. Patent No. 8,142,756; titled “Methods of Reforming Hydrocarbon Fuels Using Hexaaluminate Catalysts.”

Inventor(s): Todd Gardner, David Berry and Dushyant Shekhawat

## Significance

- Provides a method for reforming hydrocarbon fuels
- Uses hexaaluminate solid oxides
- Solves carbon deposition

## Applications

- Any application to design catalysts for hydrocarbon fuel reformation
- Dry reforming, partial oxidation, steam reforming, autothermal reforming

## Contact

NETL Technology Transfer Group  
techtransfer@netl.doe.gov

May 2012