Enhanced electrode tolerance to carbon monoxide reduces fuel processor requirements

OAAT ACCOMPLISHMENTS

CO-Tolerant Electrodes

Challenge

Small amounts of carbon monoxide (CO) from the fuel processor fuel stream contaminate the platinum catalyst used in the polymer electrolyte membrane (PEM) fuel cell. To address this issue, fuel cell electrodes that are tolerant to higher levels of CO must be developed.

Technology Description

Reconfigured anodes with improved catalysts and optimized electrode structures have been developed. Testing is carried out on single fuel cells under both steady-state and transient exposure to various levels of CO. This applied research and development seeks to achieve the following cell characteristics simultaneously:

- Optimum cell performance at operating voltage of 0.8 V;
- Minimal air injection for CO cleanup;
- Minimized precious metal catalyst loading;
- Reduced losses due to dilution at high fuel utilization.

Accomplishments

- Enhanced tolerance to CO in reformate fuel streams was achieved, along with reduced Pt catalyst loading and air bleed. New reconfigured membrane electrode assemblies (MEAs) tolerate CO levels up to 100 ppm in reformate with a catalyst loading of only 0.1 mg/cm2 with air bleed.

Testing of reconfigured anode on single fuel cell.

- New catalysts with a reconfigured anode demonstrate full tolerance to 500 ppm of CO in reformate with less than 5% air bleed and improved transient behavior for system startup.
- Tolerance to 50 ppm CO was achieved with no air bleed.

Benefits

Enhanced electrode tolerance to CO reduces fuel processor requirements and contributes to the resolution of operating issues such as system startup and transient load conditions, where large CO excursions are possible from the fuel reformer/processor.

Contacts

JoAnn Milliken
Manager, Fuel Cell R&D Program
202-586-2480
202-586-9811 fax
JoAnn.Milliken@ee.doe.gov

Tom Zawodzinski
Los Alamos National Laboratory
505-667-0925
505-665-4292 fax
zawod@lanl.gov

Commercialization

Reconfigured anodes are being tested by a number of fuel cell developers.

Future Activities

In continuation of the overall goal of minimizing the effects of hydrogen dilution and CO, efforts will be focused on:

- Improved anode catalysts, reconfigured anodes, and effectiveness of air injection for enhanced CO tolerance;
- Improved catalyst layer composition to further minimize dilution effects and increase fuel utilization;
- Improved system startup.

Partner in Success

- Los Alamos National Laboratory