Published on ***Hawaii Natural Energy Institute*** (http://www.hnei.hawaii.edu)

Cell Testing

The Hawaii Fuel Cell Test Facility (HFCTF) has extensive experience with individual fuel cell testing and fuel cell diagnostics. Past and present projects focused on assessment of impurities, the impact on low-level CO concentrations on fuel cell performance and lifetime, the impact of hydrocarbon contaminants in the anode feed stream, novel membrane material validation in single cell experiments, and testing of large-scale single cells under load cycling conditions.

Durability Testing

Initial durability work involved the successful completion of two 2,000-hour single-cell endurance tests of UTC Fuel Cell's equipment. Durability testing capabilities now include but are not limited to, static testing, load, temperature, and impurity cycling.

Hydrogen Fuels Purity Assessment

In collaboration with the U.S. Department of Energy (DOE) Hydrogen Codes and Standards Coordinating Committee and the Society of Automotive Engineers (SAE) Hydrogen Fuel Purity Working Group, Hawaii Natural Energy Institute (HNEI) is evaluating the effects of various trace contaminants in hydrogen fuel on the performance and life of polymer electrolyte membrane fuel cell (PEMFC). The results of this work will assist in assessing the required specifications for hydrogen fuels purity for use in fuel cells. The selected canary constituents of the ISO TC197 WG12 is CO, the first investigated impurity species. Results have been reported at recent Electrochemical Society and Fuel Cell Seminar meetings and publications are in preparation.

One important set of supporting equipment for the HFCTF is an on-line multi-point, high-resolution gas analysis system. Current detection limits are as low as 50 ppb for CO, CO_2, and hydrocarbons.

The present system reproducibility and accuracy allows closure of the carbon molar balance within ±2% which again allows in depth understanding of the fate of the impurity under investigation inside of the fuel cell.

Future work will address additional operating conditions as well as exposure to mixed contaminants. Contaminant exposure to cathode impurities will also be studied.

Special Projects

HNEI is working with manufacturers of fuel cells and fuel cell components to do testing of their products at the HFCTF. These projects are characterized by having funding from industrial sources as well as from the federal level. One example project will be with Atofina Chemicals, Inc., which was awarded a grant for a

three-year fuel cell project. Among the partners included in this $5.77 million grant are UTC Fuel Cells, Johnson Matthey Fuel Cells, Inc., Georgia Tech, and the University of Hawaii (HNEI). The work will advance technologies in support of DOE's vision for commercialization of PEM fuel cells and will make use of HNEI's full-scale fuel cell test capabilities (the HFCTF).

Last Updated: Saturday, July 03, 2010

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Source URL: http://www.hnei.hawaii.edu/research/fuel-cells/fuel-cell-testing/fuelcell-testing