
V.A.7 Component Benchmarking - Subtask Reported: USFCC Durability Protocol Development and Technical Assistance to Fuel Cell Component Developers

Tommy Rockward (Primary Contact),
Eric Brosha, John Davey, Fernando Garzon,
Yu Seung Kim, Rangachary Mukundan,
Bryan Pivovar, Francisco Uribe, Judith Valerio,
Mahlon Wilson and Piotr Zelenay

Los Alamos National Laboratory
PO Box 1663, MS. D429
Los Alamos, NM 87545
Phone: (505) 667-9587; Fax: (505) 665-4292
E-mail: trock@lanl.gov

DOE Technology Development Manager:
Nancy Garland
Phone: (202) 586-5673; Fax: (202) 586-9811
E-mail: Nancy.Garland@ee.doe.gov

Project Start Date: October 2003
Project End Date: Project continuation and
direction determined annually by DOE

Technical Targets

In this particular task, any of the technical targets in Table 3.4.4 may be addressed at any given time. Specifically, select tasks that apply to the technical targets in this project are listed below, while their status is listed in the 'Accomplishments' section.

- Testing of materials and participation in the further development and validation of single-cell test protocols with the USFCC.
- Offering technical assistance to USCAR and the FreedomCAR Fuel Cell Technology Team.
- Making technical experts available to the Tech Team as questions arise, focused single-cell testing to support the development of targets and test protocols.
- Participating in working and review meetings.



Objectives

- Provide assistance technically, as directed by DOE, to fuel cell component and system developers.
- Test materials and components.
- Participate in the further validation of single-cell test protocols with the United States Fuel Cell Council (USFCC).
- Provide support to the U.S. Council for Automotive Research (USCAR) and the USCAR/DOE Freedom Cooperative Automotive Research (FreedomCAR) Fuel Cell Technology Team.
- Review, comment, and refine durability protocols as necessary.
- Validate technical findings as directed by DOE.

Technical Barriers

This project can be directed to address any of the Fuel Cells technical barriers from section 3.4.4.2 of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan, however it principally addresses:

- (A) Durability
- (B) Cost
- (C) Performance

Approach

Our technically assisted efforts over the past fiscal year included a variety of collaborators from the fuel cell community. They include affiliates from other government laboratories, universities, and industry. We have consistently reached out to the fuel cell community by offering training and workshops, honoring invited presentations, and visiting and hosting (potential) collaborators. Although a large portion of this effort goes unpublished for proprietary reasons, there has been a significant thrust in developing and testing protocols. These protocols, single-cell and durability, are geared to standardize fuel cell testing to ensure reproducible results and to help address failure mechanisms, respectively. In yet another effort, we have extended our collaborations globally to include the European Union (EU).

Accomplishments

- Honored over 20 invited presentations.
- Hosted over 35 visitors to Los Alamos National Laboratory (LANL).
- Collaborated with more than 30 industrial, university, or laboratory partners.
- Participated in the review and development of USFCC durability protocols.

- Committed to participate in USFCC Accelerated Stress Testing (AST) Protocol Development Round Robin.
- LANL prepared and tested a 50 cm² fuel cell using LANL's membrane electrode assembly (MEA) fabrication for a baseline test protocol within WG-12. Testing instructions accompanied the fuel cell.
- LANL offered involvement in two round robins:
 - Evaluate the Fuel Cell Testing and Standardization Network (FCTESTNET) single-cell proton exchange membrane fuel cell (PEFC) protocol on four equivalent cells provided by the EU. The same cells will also be tested by other organizations.
 - Evaluate the standard test procedures of: EU, USA, Japan, Korea and China.
- LANL workers reviewed, corrected and commented on the Fuel Cell Testing, Safety & Quality Assurance (FCTES^{QA}) document “PEFC: Test Procedures, v1.0 (June 2006)”.
- Attended, participated, and presented at the 1st Plenary Meeting in Venice, Italy.
- Announced the LANL Hands-On Fuel Cell Training Class.

Special Recognitions & Awards/Patents Issued

1. One of five FreedomCAR Tech Team highlights of 2006: T. Rockward and F. Uribe, “Identified Method to Recover Fuel Cell Performance Loss Caused by Sulfur poisoning”, Patent Application.

FY 2007 Publications/Presentations

1. T. Rockward, J. Valerio, F. Garzon, F. Uribe, LANL's Approach to H₂/Air and Impurities PEM Fuel Cell Testing; 208th Meeting of the Electrochemical Society, October 2006, Abstract No. 602(8), p. 589.
2. Rod Borup, Jeremy Meyers, Bryan Pivovar, Yu Seung Kim, Nancy Garland, Deborah Myers, Rangachary Mukundan, Mahlon Wilson, aFernando Garzon, David Wood, Piotr Zelenay, Karren More, Tom Zawodzinski, James Boncella, James E. McGrath, Minoru Inaba, Kenji Miyatake, Michio Hori, Kenichiro Ota, Zempachi Ogumi, Seizo Miyata, Atsushi Nishikata, Zyun Siroma, Yoshiharu Uchimoto, Kazuaki Yasuda, Scientific Aspects of Polymer Electrolyte Fuel Cell Durability and Degradation, submitted to Chem. Rev., April 17, 2007.
3. J. Davey, M. Wilson, P. Zelenay, J. Valerio, and G. Bender, “Overview of Fuel Cell Membrane Electrode Assemblies (MEAs) at Los Alamos National Laboratory (LANL),” 2nd Annual Symposium on Fuel Cell MEA Manufacturing, 2006, Dayton, OH.