

Final Report

7th NSF-MEXT Joint Symposium

Fuel Cells and Related Nano-Technologies



Workshop participants with NSF and MEXT program directors- participants missing from photo are Tom Zawodzinski and Levi Thompson

Organizers Professors Watanabe and Savinell (front row second and third from left), NSF Program Managers Mihail Roco and Ken Chong (front row fourth and fifth from left) and MEXT Manager Yutaka Shimooka (front row second from right)

Co-organizers

Professor Robert F. Savinell, Case Western Reserve University

Professor Masahiro Watanabe, University of Yamanashi

October 5-7, 2007

Washington Hilton Hotel

Washington, DC

7th NSF-MEXT Joint Symposium

1. Title of symposium

Fuel Cells and Related Nanotechnologies

2. Coordinators

US: Robert F. Savinell, Prof.

Case Western Reserve University, USA

Japan: Masahiro Watanabe, Prof.

University of Yamanashi, Japan

3. Summary

Nanomaterials and nanotechnologies for fuel cells are attracting great attention for innovating high performance electrocatalysts and membranes for efficient and cost-effective fuel cell systems. By use of nanomaterials and nanotechnologies, electrocatalysts take on properties different from bulk material properties. In addition, access to total possible surface area for reaction will reduce the amount of expensive catalysts. Nanostructured materials for membranes offer promise for transport selectivity, durability, and high conduction rates. Nanotechnologies also present tools to explore and improve durability issues of critical fuel cell components. The use of nanostructured materials could increase the capacity and kinetics of hydrogen storage materials, a critical component of a new hydrogen economy.

This NSF sponsored 2.5 day workshop brought together 25 leading and younger promising researchers from US and Japan to discuss the progress and future challenges of materials and material issues confronting fuel cell and hydrogen storage development and commercialization. Since nanoscale processes and material characteristics play an important role in fuel cell performance, understanding at this length scale will be a particular focus of this workshop.

The most active scientists in this field of research were invited. Their number was limited to twelve from Japan and twelve from the USA to ensure in-depth and intensive discussion.

The goals of the symposium were (1) to help identify key research needs related to nanotechnologies and fuel cell development, and (2) to encourage US and Japan research collaborations within this field. After state-of-the-art presentations by the participants, they divided into three break-out groups to discuss recommendations. Each group dealt with one topic: Membrane Separators and MEAs; Electrocatalysts; and Hydrogen Production and Storage, and System Issues. The recommendations of the work-out groups are included in this report as an attached pdf file (IntegratedBreakOutReports.pdf)

4. Dates

October 5 (Fri.) – 7 (Sun.), 2007

5. Venue

Hilton Washington

1919 Connecticut Avenue NW

Washington, D.C.

6. Participants

A listing of the invited participants and their affiliations are given below. The Abstracts of the talks and short biographical sketches of each speaker is attached to this report.

NSF_MEXT_SpeakerAbstracts&Bios.pdf

Japan		US	
Name	Affiliation	Name	Affiliation
Etsuo Akiba	National Institute of Advanced Industrial Science and Technology (AIST)	Perla Balbuana	Texas A&M University
Tsutomu Irooi	National Institute of Advanced Industrial Science and Technology (AIST)	Nenad Markovic	Argonne National Laboratory
Kenji Miyatake	University of Yamanashi	Robert Moore	Virginia Tech
Hideki Nakagawa	Asahi Glass Co., Ltd.	Sanjeev Mukerjee	Northeastern University
Chikashi Nishimura	National Institute for Materials Science	Matthew Neurock	University of Virginia
Zempachi Ogumi	Kyoto University	Stephen Paddison	University of Tennessee
Ken-ichiro Ota	Yokohama National University	Yang Shao-Horn	Massachusetts Institute of Technology
Kazuhiko Shinohara	Nissan Research Center	Peter Strasser	University of Houston
Wataru Sugimoto	Shinshu University	Levi Thompson	University of Michigan
Katsuomi Takehira	Hiroshima University	William Tumas	University of Michigan
Hiroyuki Uchida	University of Yamanashi		

7. Time table

Oct. 5 (Fri)- Map Room

1:00-1:40 **Introduction**

K. Chong (NSF)

Y. Shimooka (MEXT)

R. Savinell (Case Western Reserve Univ.)

M. Watanabe (Univ. of Yamanashi)

1:40-4:30 **Issues & Durability**

(1:40-2:15) K. Shinohara (Nissan Motors)

(2:15-2:50) T. Zawodzinski (Case Western Reserve Univ.)

(2:50-3:20 Break)

(3:20-3:55) T. Ioroi (AIST)

Electrocatalysts I

(3:55-4:30) M. Neurock (Univ. of Virginia)

Oct. 6 (Sat)-Map Room (Breakfast service starts at 7 am)

8:00-11:55 **Electrocatalysts I (cont)**

(8-8:35) N. Markovic (ANL)

(8:35-9:10) Y. Shao-Horn (MIT)

(9:10-9:45) H. Uchida (Univ. of Yamanashi)

(9:45-10:20) P. Balbuena (Texas A&M Univ.)

(10:20-10:45 Break)

(10:45-11:20) K. Ota (Yokohama National Univ.)

(11:20-11:55) S. Mukerjee (Northeastern Univ.)

(11:55-1:20 Lunch Break)

1:20-3:05 **Electrocatalysts II**

(1:20-1:55) W. Sugimoto (Shinsyu Univ.)

(1:55-2:30) P. Strasser (Houston Univ.)

(2:30-3:05) Z. Ogumi (Kyoto Univ.)

(3:05-3:35 Break)

3:35-5:55 **Membrane MEAs**

(3:35-4:10) R. Moore (Virginia Tech.)

(4:10-4:45) H. Nakagawa (Asahi Glass)
(4:45-5:20) S. Paddison (Univ. Tennessee)
(5:20-5:55) K. Miyatake (Univ. of Yamanashi)

6:30-8:30 **Banquet Dinner Conservatory Room**

Oct. 7 (Sun) Map Room (Breakfast served beginning at 7 am)

8:00-10:55 **Hydrogen**

(8-8:35) W. Tumas (IANL)
(8:35-9:10) C. Nishimura (NIMS)
(9:10-9:45) K. Takehira (Hiroshima Univ.)
(9:45-10:20) L. Thompson (Univ. Michigan)
(10:20-10:55) E. Akiba (AIST)

11:00-12:30 **Group break-out session to discuss issues and recommended priorities for future research**

- A. Membrane separators and MEAs
- B. Electrocatalysts
- C. Hydrogen production and storage, and system issues

(12:30-1:30 Lunch Break)

1:30-3:00 **Sessions report back to group**

8. Break-out Reports

The results of the break-out sessions are included as a report/presentation from the three groups in the attached file 'IntegratedBreakOutReports.pdf'. It is obvious that advances in nanotechnologies and nanomaterials will be critical to development and commercialization of efficient, durable, and cost-effective fuel cell and hydrogen systems.