

Report

4th International Fuel Cell Workshop 2005 -PEFCs for Transportation & Stationary Power Sources- September 23 (Fri) - 24 (Sat), 2005

Sponsored by University of Yamanashi and Japan Society for the Promotion of Science (JSPS)

Co-operated by International Society of Electrochemistry (ISE), Japan Hydrogen & Fuel Cell Demonstration Project (JHFC), Japan Automobile Research Institute (JARI), Engineering Advanced Association of Japan (ENAA), The Electrochemical Society of Japan (ECSJ), Fuel Cell Development Information Center (FCDIC), The Chemical Society of Japan (CSJ), The Society of Polymer Science Japan (SPSJ), Catalysis Society of Japan (CATSJ), Yamanashi Prefecture, Yamanashi Academy of Sciences, and Kofu Chamber of Commerce and Industry

Organizer: M. Watanabe, S. Gottesfeld, U. Stimming, K. Ota, H. Kim, and H. Nishide

The 4th International Fuel Cell Workshop (IFCW) 2005 was held at Kofu Fujiya Hotel in Yamanashi, Japan, on September 23-24, 2005.

The Workshop consisted of 14 invited lectures by forefront researchers from Japan, Europe and the United States and 57 contributed poster presentations. These papers focused on recent fundamental and applied technologies concerning PEFCs for motor vehicles, on-site cogeneration systems and portable equipments. Exhibitions such as test ride of six FCEVs and a bus, demonstration of PEFCs and DMFCs, and other related products are also included. We believe that the content of this Workshop contribute to R&D in this area.

The number of participants counted ca.250 except press crews. Many participants were from outside Japan (USA, UK, Denmark, France, Korea, Hong Kong, China, Taiwan, and Indonesia). During two days, we had intensive and fruitful discussion (about 10 min for each presentation).

More information including pictures is available in the following web-site;
<http://www.clean.yamanashi.ac.jp/ifcw/contens.html>

Finally, on behalf of the organizing committee, I would like to thank the sponsorship by ISE and all the participants for taking part in such a great meeting.

Prof. Masahiro Watanabe (Workshop Chairman)

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PROGRAM

Invited oral presentations

- 1) Theoretical description of simple electrode processes
Prof. J. K. Nørskov (Tech. Univ. Denmark, Denmark)
- 2) A combined experimental and *ab initio* approach in DMFC fuel cell catalysis
Prof. A. Wieckowski (Univ. Illinois, USA)
- 3) Fast testing of electrocatalysts under fuel cell conditions
Prof. A. R. Kucernak (Imperial College London, UK)
- 4) Understanding PEFC fundamentals via multiscale modeling
Prof. C. Y. Wang (Pennsylvania State Univ., USA)
- 5) Pt alloy oxygen reduction catalysts for proton exchange membrane fuel cells
Dr. D. Thompsett (Johnson Matthey, UK)
- 6) High temperature membrane with durability for PEFCs
Mr. M. Wakizoe (Asahi Kasei Chemicals, Japan)
- 7) Advanced catalyst and membrane technology with enhanced performance and durability for automotive requirements
Dr. M. K. Debe (3M, USA)
- 8) Development of compact and efficient fuel processor for PEFC cogeneration system
Dr. N. Hashimoto (Matsushita Electric Industrial, Japan)
- 9) Progress in improving durability of PEM fuel cells for stationary and transportation applications
Dr. F. Preli (UTC Fuel Cells, USA)
- 10) Automotive cost & durability requirements for PEMFC materials
Dr. H. A. Gasteiger (General Motors, USA)
- 11) Development status of fuel cell hybrid vehicles
Mr. K. Kojima (Toyota Motor, Japan)
- 12) Development of PEFC system at Fuji Electric Advanced Technology Co., Ltd.
Mr. K. Kuroda (Fuji Electric Advanced Technology, Japan)
- 13) Toshiba DMFC for mobile applications
Mr. Y. Goto (Toshiba, Japan)
- 14) Micro fuel cells for future portable power applications
Dr. S. Gottesfeld (MTI MicroFC, USA)

Poster presentations

1. Transition metal oxides for non-platinum cathodes of PEFC
A. Ishihara, J-H. Kim, Y. Liu, S. Mitsushima, N. Kamiya, and K. Ota (Yokohama National University, Japan)
2. Electrocatalytic activity of nanocrystalline Pt-Ni alloy catalysts prepared on Ni for oxygen reduction reaction
H. Inoue, M. Shimada, T. Nakashima, S. Nohara, and C. Iwakura (Osaka Prefecture University, Japan)
3. Development of Pt-alloy cathode catalyst for PEFC
T. Tada, M. Inoue, Y. Yamamoto, and K. Matsutani (Tanaka Kikinzoku Kogyo K. K., Japan)
4. Preparation and oxygen reduction activities of highly dispersed Pt alloy catalysts
M. Kataoka, H. Yamashita, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
5. Evaluation of real activities of electrocatalysts for PEFC
E. Higuchi, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
6. Temperature-dependence of oxygen reduction activity at Nafion-coated bulk Pt and Pt-CB measured by CFDE cell
H. Yano, M. Takeichi, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
7. Pt monolayer islands deposited on Au(111): oxygen reduction and surface oxides
A. Kongkanand and S. Kuwabata (Osaka University, Japan)
8. Prospect of metal-complex catalysts for fuel cell cathodes
K. Oyaizu, M. Kitao, K. Tanaka, T. Imai, M. Yamamoto, and M. Yuasa (Tokyo University of Science, Japan)
9. Preparation of Pt/polypyrrole composite by one-step synthesis for electrode materials
M. Mizuhata, H. Takahashi, M. Oga, and S. Deki (Kobe University, Japan)
10. Anodic dissolution of platinum in acid solutions
M. Yaginuma, A. Nishikata, Y. Sugawara, S. Baba, and T. Tsuru (Tokyo Institute of Technology, Japan)
11. Direct observation of electrochemical oxidation and reduction processes of platinum catalysts by using time-resolved wave-length dispersive X-ray absorption spectroscopy
H. Imai, Y. Imai, K. Kato, K. Izumi, and Y. Kubo (NEC Corporation, Japan)
12. H₂ Dissociative Adsorption on a Pt(111) Surface
N. Arboleda, Jr., H. Kasai, H. Nakanishi, and W. A. Diño (Osaka University, Japan)
13. On fuel cell applications: the H-Pt(111) case revisited
T. Roman, H. Nakanishi, W. A. Diño, and H. Kasai (Osaka University, Japan)
14. Increasing the ortho-para H₂ conversion yield on surfaces using molecular orientation of H₂ and inhomogeneity of spin density distribution
R. Muhida, M. David, Md. M. Rahman, W. A. Diño, H. Nakanishi, H. Kasai, K. Fukutani,

and T. Okano (Osaka University, Japan)

15. The mechanisms of proton production and initial proton transfer on the anode side of Nafion
M. Tsuda, N.B. Arboleda. Jr., E. S. Dy, and H. Kasai (Osaka University, Japan)
16. Development of novel ultra-low platinum and platinum-ruthenium binary alloy loading electrodes for PEFC
S. Hitomi, M. Kohmoto, T. Yamafuku, and E. Nomura (GS Yuasa Corporation, Japan)
17. Preparation of electrocatalyst for PEFCs using the barrel sputtering system and its electrochemical properties
M. Inoue, S. Akamaru, K. Watanabe, and T. Abe (Toyama University, Japan)
18. ATR-FTIRAS study of adsorbed hydrogen and CO on a Pt electrode in sulfuric acid
K. Kunitatsu, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
19. Structures of CO adlayers on Pt(111) and Pt(100) electrode surfaces in aqueous solution studied by in-situ STM
T. Yoneyama, M. Wakisaka, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
20. Analysis of CO-tolerance at Pt alloy electrodes by photoelectron spectroscopy combined with an electrochemical cell
S. Mitsui, M. Wakisaka, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
21. Novel CO-tolerant catalysts using gold nanoparticles for direct methanol fuel cells
K. Miyazaki, Y. Nishida, Y. Iriyama, T. Abe, M. Matsuoka, and Z. Ogumi (Kyoto University, Japan)
22. Characterization of new CO tolerant anode catalysts based on organic metal complexes for PEFCs and DMFCs
T. Okada, H. Yano, M. Saito, C. Ono, and H. Shiroishi (National Institute of Advanced Industrial Science and Technology, Japan)
23. DMFC catalyst development at TKK
K. Matsutani, Y. Yamamoto, and T. Tada (Tanaka Kikinzoku Kogyo K. K., Japan)
24. Electrochemical impedance spectroscopy on the methanol oxidation behavior of Pt/C and PtRu/C
W. Sugimoto, T. Kawaguchi, Y. Murakami, and Y. Takasu (Shinshu University, Japan)
25. Methanol and 2-propanol electrooxidation at elevated temperature and pressurized condition
M. Umeda and I. Uchida (Nagaoka University of Technology, Japan)
26. Structural effects on the oxidation of formic acid on stepped surfaces of palladium
N. Hoshi, K. Kida, and M. Nakamura (Chiba University, Japan)
27. Arrayed nanocomposites for electrochemical energy generation and storage applications
C-L. Sun, W-C. Fang, K-H. Chen, O. Chyan, and L-C. Chen (Academia Sinica, Taiwan)
28. Development of simultaneous measurement of water vapor adsorption and proton conductivity in PEM for PEFC
M. Yoshida and K. Nakai (BEL Japan Inc., Japan)

29. Ion-gels prepared by incorporation of protic ionic liquids in porous polymer membranes as anhydrous proton conducting electrolytes
N. Ishibashi, M.A.B.H. Susan, H. Nakamoto, and M. Watanabe (Yokohama National University, Japan)
30. Synthesis of polyamidesulfamide acid as a new proton-conductive membrane
T. Tago, N. Morishita, and H. Nishide (Waseda University, Japan)
31. Proton conductive polymer complex membranes prepared by layer-by-layer adsorption
H. Shibata, T. Tago, and H. Nishide (Waseda University, Japan)
32. Poly(vinylpyrrolidone) (PVP) modified poly(vinyl alcohol) /2-acrylamido-2-methyl-1-propanesulfonic acid (PVA-PAMPS) blend membranes for low temperature DMFC
J. Qiao, T. Hamaya, and T. Okada (National Institute of Advanced Industrial Science and Technology, Japan)
33. Novel poly(arylene ether) ionomer membranes for high temperature PEFCs
Y. Chikashige, K. Miyatake, and M. Watanabe (University of Yamanashi, Japan)
34. Effect of side alkyl chain on the properties of sulfonated polyimide ionomers
T. Yasuda, K. Miyatake, M. Hirai, M. Nanasawa, and M. Watanabe (University of Yamanashi, Japan)
35. Block copolyimide ionomer membranes for polymer electrolyte fuel cell applications
N. Asano, K. Miyatake, and M. Watanabe (University of Yamanashi, Japan)
36. Preparation of MEA and direct methanol fuel cell performances for sulfonated polyimide
O. Yamada, T. Ogo, K. Tanaka, H. Kita, and K. Okamoto (Yamaguchi University, Japan)
37. Development of novel hybrid electrode for high temperature PEFCs
J. M. Lee, G. M. Anilkumar, and T. Yamaguchi (University of Tokyo, Japan)
38. Development of highly durable MEA for PEMFC under high temperature and low humidity operations
E. Endoh (Asahi Glass Co., Ltd., Japan)
39. Progress in high efficiency and durable MEA for active DMFC systems
R. Iwata, S. Kikuyama, K. Kakuda, M. Motomatsu, M. Kaku, and M. Abdou (DuPont Fuel Cells, Japan)
40. Methanol crossover through a passive DMFC using porous support
M. A. Abdelkareem, K. Sekimoto, and N. Nakagawa (Gunma University, Japan)
41. Development of PEFC MEA suitable for low humidification operation
O. Hiroi, H. Fukumoto, S. Yoshioka, H. Kuriki, and T. Nishimura (Mitsubishi Electric Corporation, Japan)
42. Degradation of Nafion membranes in hydrogen peroxide
K. Kodama, F. Miura, N. Hasegawa, M. Kawasumi, and Y. Morimoto (Toyota Central Research and Development Labs., Inc., Japan)

43. Novel method to evaluate electrolyte degradation rate in PEFC
M. Aoki, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
44. Analysis of the eluates from polymer electrolyte membrane by hydroxyradical treatment
N. Sato, T. Hironaka, M. Kitagawa, K. Ookubo, Y. Taguchi, and H. Kondo (Toray Research Center, Inc., Japan)
45. Morphological analysis of electrolyte in catalyst layer of PEFC electrode
A. Masuda, T. Harada, T. Ito, and Y. Otsuka (Toray Research Center Inc., Japan)
46. Morphological change of carbon surface caused by oxidative corrosion as model of PEMFC cathode degradation
Z. Siroma, K. Ishii, M. Inaba, A. Tasaka, Y. Miyazaki, and K. Yasuda (National Institute of Advanced Industrial Science and Technology, Japan)
47. Plasma water-proofing for polymer electrolyte fuel cells
A. Taniguchi and K. Yasuda (National Institute of Advanced Industrial Science and Technology, Japan)
48. In situ analytical technique for flooding in PEFCs
Y. Morimoto, T. Hatanaka, H. Murata, T. Suzuki, and H. Yamada (Toyota Central Research and Development Labs., Inc., Japan)
49. Long term observation of water droplets distribution in a cathode
-visualized changes of reaction field with time under degradation factors-
T. Murahashi, H. Kobayashi, and E. Nishiyama (Fukui University of Technology, Japan)
50. Computational fluid dynamics considering influence of anode electrode structure for micro direct methanol fuel cell design
M. Sugimura, K. Yasuda, N. Nakao, M. Matsushima, and K. Fujimoto (Osaka University, Japan)
51. Fluent based PEMFC numerical modeling and validation
V. Palanisamy, J. Li, and X. Wang (Fluent Asia Pacific Co., Ltd., Japan)
52. Direct numerical simulation of gas-water two-phase flow in polymer electrolyte fuel cells
K. Suzuki, M. Yoneda, Y. Tago, and M. Takimoto (Mizuho Information & Research Institute, Inc., Japan)
53. A finite element analysis of stationary transport problems in a GDL of the PEFC
H. Kanayama, M. Mino, and H. Aihara (Kyushu University, Japan)
54. Optical oxygen sensing coating composed of poly(pyridylpropyne-co- trimethylsilylpropyne) and palladiumporphyrin
T. Hyakutake and H. Nishide (Waseda University, Japan)
55. Production of the hydrogen by methane steam reforming over nickel catalyst prepared by solution-spraying plasma technology
X. Chen, M. Kotobuki, H. Yamashita, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)

56. Reaction mechanism of preferential oxidation of carbon monoxide on Pt, Fe, and Pt-Fe/mordenite catalysts
M. Kotobuki, A. Watanabe, H. Yamashita, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
57. Development of a new metal separator coated with carbon/resin composite
T. Okumoto, S. Kitta, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)

Exhibitions with poster presentations

58. Stationary FC demonstration study and large scale demonstration project -- national project toward the commercialization of stationary fuel cell-- (New Energy Foundation, Japan)
59. Home-use fuel cell cogeneration system of Panasonic
M. Uchida (Matsushita Electric Industrial Co., Ltd., Japan)
60. Development of 1 kW class DMFC system "YFC-1000" and examination of new applications to agricultural use
T. Watanabe, T. Yamao, T. Sano, F. Ishimaru, and E. Nomura (GS-Yuasa Corporation, Japan)
61. World's smallest DMFC (Toshiba Corp., Japan)
62. Direct methanol fuel cells for laptop PC (NEC Corp., Japan)
63. Direct methanol fuel cells for mobile equipments (Hitachi Ltd., Japan)
64. Pore filling electrolyte membranes for DMFC (Toagosei Co., Ltd., Japan)
65. Channel flow double electrode cell (Eiwa Corp./ University of Yamanashi, Japan)

Test run and demonstration of fuel cell vehicles

(co-operated with Japan Hydrogen & Fuel Cell Demonstration Project (JHFC), Japan Automobile Research Institute (JARI), and Engineering Advanced Association of Japan (ENAA))

1. Toyota FCHV (Toyota Motor Corp., Japan)
2. Nissan X-trail FCV (Nissan Motor Co., Ltd., Japan)

3. Honda FCX
(Honda Motor Co., Ltd., Japan)
4. DaimlerChrysler F-Cell
(DaimlerChrysler Japan)
5. General Motors HydroGen3
(GM Asia Pacific Japan Ltd.)
6. Mitsubishi FCV
(Mitsubishi Motors Corp., Japan)
7. Suzuki wagonR-FCV
(Suzuki Motor Corp., Japan)
8. Toyota/Hino FCHV-BUS2
(Toyota Motor Corp./Hino Motors, Ltd., Japan)
9. JHFC Hydrogen Station
(Babcock-Hitachi K.K., Japan)