

## “The 5th International Fuel Cell Workshop 2009” Conference Report

The 5th International Fuel Cell Workshop 2009 was held on Sunday, August 23 and Monday, August 24 at the Kofu Fujiya Hotel, with 196 people attending. Opening remarks were presented by M. Watanabe (Workshop Chairman, University of Yamanashi), the organizer’s speech was given by S. Maeda (President, University of Yamanashi), and then congratulatory speeches were made by H. Aki (Deputy Director, Hydrogen and FC Promotion Office, METI) and S. Yokouchi (Governor, Yamanashi Prefecture).

Starting with the keynote lecture of S. Miyata (NEDO), “Overview of NEDO PEFC activities,” oral and poster presentations (68 topics) of the latest research on fuel cells followed.

Toyota, Nissan and Honda held an exhibition of fuel cell-powered electric vehicles, which included test driving at the prefectural office building and the Kofu Fujiya Hotel. A total of 354 people from the public and individuals directly related to companies took test rides in the fuel cell-powered electric vehicles. In addition, exhibitions (8 topics) were held on fuel cells for residential applications, as well as portable and micro-fuel cells.

1. Conference Name: The 5th International Fuel Cell Workshop 2009
2. Date: Sunday, August 23 and Monday, August 24
3. Place: Kofu Fujiya Hotel  
(3-2-30 Yumura, Kofu-shi, Yamanashi, 400-0073, JAPAN)
4. Participants: 196 people ( including 25 foreigners)
5. Organizers:

M. Watanabe	University of Yamanashi, Japan
U. Stimming	Technical University of Munich, Germany
H. Kim	Seoul National University, Korea
H. Gasteiger	Massachusetts Institute of Technology, USA
H. Nishide	Waseda University, Japan
K. Ota	Yokohama National University, Japan
6. Secretary-general

H. Uchida	University of Yamanashi, Japan
K. Miyatake	University of Yamanashi, Japan
T. Omata	University of Yamanashi, Japan
7. Hosted by: University of Yamanashi

8. Supported by:

New Energy and Industrial Technology Development Organization (NEDO),  
International Society of Electrochemistry (ISE), The Electrochemical Society of Japan (ECSJ), The Chemical Society of Japan (CSJ), The Society of Polymer Science, Japan (SPSJ), Catalysis Society of Japan (CATSJ), The Japan Institute of Energy (JIE), Ministry of Education, Culture, Sports, Science, and Technology (MEXT)  
Ministry of Economy, Trade, and Industry (METI), Yamanashi Prefecture, Japan Science and Technology Agency (JST), Japan Hydrogen & Fuel Cell Demonstration Project (JHFC) (Japan Petroleum Energy Center (JPEC), Japan Automobile Research Institute (JARI), Engineering Advancement Association of Japan (ENAA), The Japan Gas Association (JGA)), New Energy Foundation (NEF), National Institute of Advanced Industrial Science and Technology (AIST), Polymer Electrolyte Fuel Cell Cutting-Edge Research Center (FC-Cubic), Fuel Cell Commercialization Conference of Japan (FCCJ)  
Fuel Cell Development Information Center (FCDIC), Yamanashi Academy of Sciences  
Kofu Chamber of Commerce and Industry

9. Keynote lecture

“Overview of NEDO PEFC activities”

S. Miyata (New Energy and Industrial Technology Development Organization, Japan)

10. Oral Presentations

(1) “Model PEM fuel cell electrocatalysts: alloy, particle size and support effects”

B. E. Hayden (Southampton University, UK)

(2) “Design and synthesis of low-Pt & non-Pt nanoparticle catalysts for fuel cells”

Y.-E. Sung (Seoul National University, Korea)

(3) “Current progress of electrocatalyst R&D in TKK”

T. Tada (Tanaka Kikinzoku Kogyo K. K., Japan)

(4) “Design of innovative membranes for polymer electrolyte fuel cells”

D. J. Jones (Université Montpellier II, France)

(5) “Development of high performance perfluorinated membrane and MEA for polymer electrolyte fuel cells”

I. Terada (Asahi Glass Co., Ltd., Japan)

(6) “Decreasing platinum loading in polymer electrolyte fuel cell”

B. Pivovar (National Renewable Energy Laboratory, USA)

(7) “Understanding catalyst layer toward durable, cost-effective, and robust PEFCs”

Y. Morimoto (Toyota Central R&D Labs. Inc., Japan)

- (8) “Research and development in the HiPer-FC project”  
M. Watanabe (University of Yamanashi, Japan)
- (9) “Hydrogen storage materials: present and future”  
E. Akiba (National Institute of Advanced Industrial Science and Technology, Japan)
- (10) “Fuel cell vehicles: consensus (?) and controversy on electrocatalytic challenges”  
F. T. Wagner (General Motors Research and Development, USA)
- (11) “Nissan FCV development - challenges for durability and cost”  
A. Iiyama (Nissan Motor Co., Ltd., Japan)
- (12) “The status of direct methanol fuel cells”  
D. Chu (US Army Research Laboratory, USA)
- (13) “Improvement of cell stack components for commercializing residential PEMFC CHP systems”  
H. Adachi (The Japan Institute of Energy, Japan)

(Appendix I)

## 5th IFCW2009 Program

Aug. 23 (Sun)	9:00- 9:20	Opening remarks M. Watanabe (Workshop Chairman, University of Yamanashi) S. Maeda (President, University of Yamanashi)  Congratulatory Speeches  K. Iida (Director, Hydrogen and FC Promotion Office, METI) S. Yokouchi (Governor, Yamanashi Prefecture)
	<i>Presiding: M. Watanabe</i>	
	9:20-9:40	Keynote lecture "Overview of NEDO PEFC activities" S. Miyata (New Energy and Industrial Technology Development Organization, Japan)
	<i>Presiding: H. Kim and A. Wieckowski</i>	
	9:40-10:30	"Model PEM fuel cell electrocatalysts: alloy, particle size and support effects" B. E. Hayden (Southampton University, UK)
	10:30-11:20	"Design and synthesis of low-Pt & non-Pt nanoparticle catalysts for fuel cells" Y.-E. Sung (Seoul National University, Korea)
	11:20-12:10	"Current progress of electrocatalyst R&D in TKK" T. Tada (Tanaka Kikinzoku Kogyo K. K., Japan)
	12:10-13:10	<i>Lunch</i>
	<i>Presiding: B. Pivovar and H. Nishide</i>	
	13:10-14:00	"Design of innovative membranes for polymer electrolyte fuel cells" D. J. Jones (Université Montpellier II, France)
	14:00-14:50	"Development of high performance perfluorinated membrane and MEA for polymer electrolyte fuel cells" I. Terada (Asahi Glass Co., Ltd., Japan)
	14:50-15:40	"Decreasing platinum loading in polymer electrolyte fuel cell" B. Pivovar (National Renewable Energy Laboratory, USA)
	15:40-16:00	<i>Coffee break</i>
	<i>Presiding: A. Iiyama and F. T. Wagner</i>	
	16:00-16:50	"Understanding catalyst layer toward durable, cost-effective, and robust PEFCs" Y. Morimoto (Toyota Central R&D Labs. Inc., Japan)
	16:50-17:40	"Research and development in the HiPer-FC project" M. Watanabe (University of Yamanashi, Japan)
	18:00-20:00	<i>Banquet</i>

Aug. 24 (Mon)	<i>Presiding: H. Gasteiger and M. Uchida</i>	
	9:00- 9:50	“Hydrogen storage materials: present and future” E. Akiba (National Institute of Advanced Industrial Science and Technology, Japan)
	9:50-10:40	“Fuel cell vehicles: consensus (?) and controversy on electrocatalytic challenges” F. T. Wagner (General Motors Research and Development, USA)
	10:40-11:30	“Nissan FCV development - challenges for durability and cost” A. Iiyama (Nissan Motor Co., Ltd., Japan)
	11:30-12:30	<i>Lunch</i>
	<i>Presiding: K. Higashiyama and D. A. Tryk</i>	
	12:30-15:20	Poster presentation, exhibition, and FCEV test ride
	(12:30-13:40)	<b><i>Obligation time for odd numbered posters</i></b>
	(13:50-15:00)	<b><i>Obligation time for even numbered posters</i></b>
	<i>Presiding: U. Stimming and H. Uchida</i>	
15:20-16:05	“The status of direct methanol fuel cells” D. Chu (US Army Research Laboratory, USA)	
16:05-16:50	“Improvement of cell stack components for commercializing residential PEMFC CHP systems” H. Adachi (The Japan Institute of Energy, Japan)	
16:50-17:00	Closing Remarks U. Stimming (Technical University of Munich)	

## Poster presentations

- 1) Carbon nitride catalysts for electrochemical oxygen reduction  
S. M. Lyth, Y. Nabaе, S. Moriya, S. Kuroki, M. Kakimoto, J. Ozaki, and S. Miyata (Tokyo Institute of Technology, Japan)
- 2) Solid-state  $^{15}\text{N}$  NMR, XPS and ESR characterization of ORR active pyrolyzed polypyrroles  
S. Kuroki, J. Ozaki, and S. Miyata (Tokyo Institute of Technology, Japan)
- 3) Tantalum oxide-based cathode without precious metals for PEFC  
A. Ishihara, M. Tamura, K. Matsuzawa, S. Mitsushima, and K. Ota (Yokohama National University, Japan)
- 4) Platinum-free inorganic electro-catalysts for fuel cells supported on carbon nanotubes  
T. Okada, S. Soukura, and J. Nakamura (University of Tsukuba, Japan)
- 5) Preparation and characterization of monodispersed Pt/CB catalysts prepared with Pt-carbonyl cluster  
E. Higuchi, A. Taguchi, K. Hayashi, and H. Inoue (Osaka Prefecture University, Japan)
- 6) Synthesis in aqueous medium of highly dispersed Pt nanoelectrocatalysts  
A. Patru, T. W. Napporn, S. Baranton, and C. Coutanceau (University of Poitiers, France)
- 7) Potential cycling effect on dissolution of platinum in sulfuric acid solution  
Y. Sugawara, A. P. Yadav, A. Nishikata, and T. Tsuru (Tokyo Institute of Technology, Japan)
- 8) Platinum deterioration mechanism in concentrated  $\text{H}_2\text{SO}_4$  studied by rotating ring-disk electrode and electrochemical quartz crystal microbalance  
M. Umeda, Y. Kuwahara, A. Nakazawa, and M. Inoue (Nagaoka University of Technology, Japan)

- 9) In-situ AFM study of cubic Pt nano-particles in electrochemical environment  
H. Kikuchi, W. Ouchida, M. Yamada, C. Goto, and N. Hoshi (Chiba University, Japan)
- 10) Carbon substrate modification for platinum particles stabilization  
M. Weissman, R. Sellin, P. Urchaga, S. Baranton, and C. Coutanceau (University of Poitiers, France)
- 11) Investigations of Pt/polypyrrole loaded carbon composite catalyst for durability improvement of PEFC cathode  
K. Matsumoto, M. Oga, M. Mizuhata, and S. Deki (Kobe University, Japan)
- 12) Suppression of Pt catalyst degradation with oxide nanosheets  
W. Sugimoto, T. Saida, C. Chauvin, and Y. Takasu (Shinshu University, Japan)
- 13) First principles study of Pt dissolution into aqueous solution  
R. Jinnouchi, T. Hatanaka, and Y. Morimoto (Toyota Central R&D Labs., Inc. Japan)
- 14) Quantitative analysis of poisoning effects of anions on oxygen reduction reaction on Pt  
K. Kudo and Y. Morimoto (Toyota Central R&D Labs., Inc. Japan)
- 15) Effect of particle size of platinum & platinum cobalt catalyst on stability against load cycling  
K. Matsutani, K. Hayakawa, and T. Tada (Tanaka Kikinzoku Kogyo K.K., Japan)
- 16) Anodic dissolution of Pt-M(M: Co, Ni, Fe) alloy catalysts in sulfuric acid solution  
Y. Hoshi, A. P. Yadav, A. Nishikata, and T. Tsuru (Tokyo Institute of Technology, Japan)
- 17) Mass activity and durability of Pt<sub>shell</sub>/Au<sub>core</sub>/C core-shell catalyst  
H. Yamada, H. Tsuji, H. Ito, A. Tasaka, and M. Inaba (Nara National College of Technology, Japan)
- 18) Studies on ORR mechanism of Pt/M/C (M = Pd, Au) core-shell catalyst by in situ

electrochemical X-ray absorption spectroscopy

Y. Uchimoto, H. Aoki, and T. Fukutsuka (Kyoto University, Japan)

- 19) Platinum modified palladium electrocatalyst for polymer electrolyte membrane fuel cell

H. Y. Park, K. S. Lee, T. Y. Jeon, and Y. E. Sung (Seoul National University, Korea)

- 20) Platinum-alloy cathode catalyst degradation in proton exchange membrane fuel cells: nanometer-scale compositional and morphological changes

S. Chen, H. A. Gasteiger, K. Hayakawa, T. Tada, and Y. Shao-Horn (Massachusetts Institute of Technology, USA)

- 21) In situ ATR-SEIRA study of reaction intermediates of ORR on Au/Ti double-layer film electrodes in acidic solutions

K. Nomura, N. Ohta, and I. Yagi (National Institute of Advanced Industrial Science and Technology, Japan)

- 22) In-situ ATR-FTIRAS study of methanol adsorption/oxidation on a highly dispersed platinum/carbon catalyst

H. Hanawa, K. Kunimatsu, K. Yagi, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)

- 23) Methanol oxidation activity of PtRu catalysts and their microstructures

H. Daimon, Y. Kurobe, T. Onodera, T. Nakagawa, S. Seino, H. Nitani, and T. Yamamoto (Hitachi Maxell, Ltd., Japan)

- 24) Synthesis and properties of anion exchange membranes

M. A. Hickner (The Pennsylvania State University, USA)

- 25) Fabrication of protic ionic liquid/sulfonated polyimide composite membrane for non-humidified intermediate temperature fuel cells

T. Yasuda, S. Y. Lee, S. Nakamura, and M. Watanabe (Yokohama National University, Japan)

- 26) Physicochemical properties of protic ionic liquids as electrolytes for non-humidified intermediate temperature fuel cells  
M. Kanno, A. Ogawa, T. Yasuda, and M. Watanabe (Yokohama National University, Japan)
- 27) Rapid proton conduction through structured water in a wholly aromatic pore-filling electrolyte membrane  
N. Hara, T. Tamaki, H. Ohashi, and T. Yamaguchi (Tokyo Institute of Technology, Japan)
- 28) Structural and dynamical properties of the water molecules in polyelectrolyte membranes: a study combining molecular dynamics simulation and NMR relaxation  
T. Ohkubo, K. Kidena, N. Takimoto, and A. Ohira (National Institute of Advanced Industrial Science and Technology, Japan)
- 29) Characterization of PEM by combined techniques between electrochemical and adsorption measurement  
M. Yoshida, T. Gomoto, and K. Nakai (BEL JAPAN Inc., Japan)
- 30) Development of highly reliable and robust membrane electrode assembly for PEFC co-generation systems  
H. Takami, S. Suzuki, K. Matsuoka, K. Nakato, A. Hamada, S. Sakamoto, and A. Fukunaga (Eneos Celltech Co., Ltd, Japan)
- 31) Development of high-robust MEA for PEFC  
Y. Tsuji, H. Kameda, and K. Yamada (Panasonic Corp., Japan)
- 32) Fuel cell electrodes with ultra-low Pt loadings  
P. Brault, C. Coutanceau, M. Mougnot, R. Escalier, A. Caillard, Y. Tessier, M. Cavarroc, M. Vogt, A. Ennajdaoui, S. Roualdes, J. Durand, C. Charles, and R. Boswell (University of Poitiers, France)
- 33) Understanding and optimization of fuel cell electrode structures  
C. M. Johnston and Y. S. Kim (Los Alamos National Laboratory, USA)
- 34) Thermal conductivity measurement for gas diffusion medium under various conditions  
J. Miyamoto, J. Ooyama, and Y. Yamamoto (National Institute of Advanced Industrial Science and Technology, Japan)

- 35) A mathematical model of three-dimensional two-phase transport in polymer electrolyte fuel cells  
Y. Tachikawa, Y. Matsuda, and H. Kanayama (Kyushu University, Japan)
- 36) Detection of OH radicals generated in polymer electrolyte fuel cells  
Y. Nosaka, N. Oguri, K. Ohtaka, and A. Y. Nosaka (Nagaoka University, Japan)
- 37) Affects of metal impurities on water molecules in MEA for polymer electrolyte fuel cells  
A. Y. Nosaka, N. Soeta, S. Kawada, and Y. Nosaka (Nagaoka University, Japan)
- 38) Computational modeling of transport phenomena in polymer electrolyte membranes, Nafion and hydrocarbon membrane  
Y.-K. Choe, E. Tsuchida, and T. Ikeshoji (National Institute of Advanced Industrial Science and Technology, Japan)
- 39) Development of an environmental cell for nanomaterials investigation by high resolution transmission electron microscopy  
T. Yaguchi, A. Watabe, Y. Nagakubo, and T. Kamino (Hitachi High-Technologies Corp., Japan)
- 40) Electrochemical oxidation of CO on Pt(111) single crystal electrodes with steps studied by electrochemical STM  
K. Abe, S. Ashizawa, M. Wakisaka, J. Inukai, H. Uchida, N. Furuya, and M. Watanabe (University of Yamanashi, Japan)
- 41) Adsorption/oxidation of carbon monoxide on Pt/C, PtRu/C, Pt<sub>3</sub>Co/C catalysts studied by ATR-FTIRAS  
T. Sato, K. Kunimatsu, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
- 42) Highly CO-tolerant Pt-alloy HOR catalysts and analyses of the mechanisms  
T. Shimizu, T. Tian, K. Okaya, T. Sato, and H. Uchida (University of Yamanashi, Japan)
- 43) Improving CO tolerance of PtRu/C catalyst by the anode of tin oxide  
G. X. Wang, T. Takeguchi, T. Yamanaka, E. N. Muhamad, and W. Ueda (Hokkaido University, Japan)
- 44) CO oxidation catalysts using Rh porphyrins  
S. Yamazaki and K. Yasuda (National Institute of Advanced Industrial Science and Technology, Japan)

- 45) An excellent CO tolerance of anode catalysts of subnano-Pt clusters supported on graphene nanosheets  
E. J. Yoo, I. Honma, and J. Nakamura (University of Tsukuba, Japan)
- 46) Research and development on nanomaterials for high performance fuel cells  
~ HiPer-FC project ~  
University of Yamanashi, Kaneka Corp., Toray Research Center, Inc., Fuji Electric Advanced Technology Co., Ltd., Tanaka Kikinzoku Kogyo K. K., Shimazu Corp., Panasonic Co., Ltd., University of Tokyo, and Waseda University
- 47) High durability of Pt/graphitized carbon catalysts prepared by the nanocapsule method  
T. Akiyama, H. Yano, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
- 48) Degradation of carbon supports in the cathode of PEFC cathodes studied by visualization of oxygen  
Y. Ishigami, K. Takada, J. Inukai, Y. Nagumo, H. Nishide, and M. Watanabe (University of Yamanashi, Japan)
- 49) In-situ CO<sub>2</sub> detection for fuel cells by pyrene-containing polymer coating  
I. Maeda, T. Suga, H. Nishide, and M. Watanabe (Waseda University, Japan)
- 50) In-situ visualization of temperature distribution for a fuel cell using poly(diphenylacetylene)-based polymer coating  
Y. Higuchi, T. Suga, H. Nishide, Y. Ishigami, K. Takada, J. Inukai, and M. Watanabe (Waseda University, Japan)
- 51) EC-XPS analysis of oxygen species adsorbed on Pt single crystal electrodes during the oxygen reduction reaction  
Y. Udagawa, M. Wakisaka, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
- 52) In-situ ATR-FTIRAS study of oxygen reduction reaction at Pt/Nafion interface  
K. Kunimatsu, T. Yoda, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
- 53) Control of particle size of Pt and Pt alloy catalysts supported on carbon by the nanocapsule method  
K. Okaya, H. Yano, H. Uchida, and M. Watanabe (University of Yamanashi,

Japan)

- 54) High temperature water-gas shift reaction over Ni-Fe-Ce nano-composites prepared by solution-spray plasma technique  
K. Watanabe, T. Miyao, K. Higashiyama, H. Yamashita, and M. Watanabe (University of Yamanashi, Japan)
- 55) Selective CO methanation in hydrogen-rich gases over Ru/NiAl<sub>2</sub>O<sub>4</sub> catalyst prepared by the solution-spray plasma technique  
T. Miyao, M. Kimura, A. Chen, K. Higashiyama, H. Yamashita, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
- 56) Compact fuel processor employing monolithic type catalysts for hydrogen production and purification  
S. Komori, M. Kimura, K. Watanabe, T. Takazoe, T. Naoi, H. Yamashita, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
- 57) Synthesis and characterization of sulfonated block copolymer membranes containing fluorenyl groups  
B. Bae, K. Miyatake, and M. Watanabe (University of Yamanashi, Japan)
- 58) Poly(arylene ether)s containing superacid groups  
T. Mikami, T. Shimura, K. Miyatake, and M. Watanabe (University of Yamanashi, Japan)
- 59) Synthesis and properties of novel polyimide ionomers containing mobile hydrogen  
J. Saito, M. Tanaka, K. Miyatake, and M. Watanabe (University of Yamanashi, Japan)
- 60) Research and development of hydrocarbon electrolyte membranes for PEFC in Kaneka Corporation  
T. Hayano, S. Matsuno, Y. Sawada, T. Miyahara, H. Kuromatsu, H. Iwakiri, and A. Ishihara (Kaneka Corporation, Japan)
- 61) Analysis of degradation mechanism of sulfonated polyimide membrane in the mixed-gas exposure method  
N. Sato, Y. Sakiyama, H. Hasegawa, K. Tanabe, M. Takasaki, K. Ookubo, H. Furuya, T. Ida, K. Miyatake, H. Uchida, and M. Watanabe (Toray Research Center, Inc., Japan)
- 62) New quantitative treatment of the oxygen reduction reaction on ionomer

film-covered platinum-carbon catalysts on a rotating disk electrode

D. A. Tryk, K. Miyatake, T. Omata, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)

- 63) Preparation and evaluation of electrocatalyst layers using polyimide ionomer  
T. Omata, M. Tanaka, K. Miyatake, M. Uchida, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
- 64) Improvement of the performance of cathode catalyst layers containing sulfonated poly(arylene ether) binder for PEFC  
T. Yoda, T. Shimura, B. Bae, K. Miyatake, M. Uchida, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
- 65) New evaluation method for the effectiveness of electrocatalysts under PEFC operation conditions  
M. S. Lee, M. Uchida, H. Yano, T. Yoda, H. Uchida, and M. Watanabe (University of Yamanashi, Japan)
- 66) PtRu overlayers on carbon-supported Au nanoparticles as anode catalysts for direct methanol fuel cells  
K.-S. Lee, I.-S. Park, H.-Y. Park, T.-Y. Jeon, Y.-E. Sung (Seoul National University, Korea)
- 67) Surface properties and methanol oxidation reaction of carbon-supported Pt-Ru nanoparticles  
T.-Y. Jeon, K.-S. Lee, Y.-H. Cho, H.-Y. Park, S. J. Yoo and Y.-E. Sung (Seoul National University, Korea)
- 68) Influence of ambient air condition on the power generation characteristics of a passive DMFC with 100% methanol  
T. Tsujiguchi, M. A. Abdelkareem, T. Kudo, N. Nagasawa, T. Shimizu, M. Matsuda (Gunma University, Japan)

## Exhibitions with poster presentations

- 1) Household fuel cell cogeneration system  
Panasonic Corp., Japan
- 2) Channel flow double electrode cell  
FC Development Co., Ltd., Eiwa Corp., and University of Yamanashi, Japan
- 3) Visualization system of oxygen distribution for PEFC  
Shimadzu Corp., Japan
- 4) New fuel reformer for PEFC system  
University of Yamanashi, Sanyo Kiko Co., Ltd., and Nippon Chemical Plant  
Consultant Co., Ltd., Japan
- 5) Corrosion-resistant metal separators coated with resin for polymer electrolyte  
fuel cells  
Ask Technica Corp., Japan

## Test run and demonstration of fuel cell vehicles

Supported by

Japan Hydrogen & Fuel Cell Demonstration Project (JHFC)

Japan Petroleum Energy Center (JPEC)

Japan Automobile Research Institute (JARI)

Engineering Advancement Association of Japan (ENAA)

The Japan Gas Association (JGA)

- 1) Toyota FCHV-adv  
Toyota Motor Corp., Japan
- 2) Nissan X-TRAIL FCV  
Nissan Motor Co., Ltd., Japan
- 3) FCX CLARITY  
Honda Motor Co., Ltd., Japan

