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NHA President Explores Chinese Research Strengths and Promotes U.S./China Collaboration

by Jeffrey A. Serfass
President, NHA

Jeff Serfass, NHA President, spoke at the 7th Chinese Hydrogen Energy Conference, held this year in Wuhan, Hubei, China, 4-5 November 2006. Speakers from **Singapore's Nanyang Technology University,** (JIANG San Ping), **European Hydrogen Association** (Marieke Reijalt), **Japan's Hydrogen Technology Research Center** (Kazunari Sasaki), and **Canada's National Research Council** (Sébastien Prince-Richard) also spoke in English with oral translation to Chinese. All other presentations in the two-day conference were in Chinese.

Dr. PAN Mu, **Wuhan University of Technology (WHUT)**, chaired the 200+ person Conference and Dr. MAO Zong Qiang, Chairman of the **China Association for Hydrogen Energy** was one of the keynote speakers. Others participating included:

- Beijing SinoHytec
- China Industrial Gases Industry Association
- China Society for Renewable Energy
- Dalian Institute of Chemical Physics
- Hydrogenics
- Nanjing University of Technology
- Nanjing University
- Nanyang Technological University
- Shanghai Jiaotong University
- Shell Hydrogen
- Tianjin University
- Tongji University
- Tsinghua University
- Zhejiang University

The invited presentation by Mr. Serfass was on U.S. hydrogen activities and areas for Chinese-U.S. collaboration.

Dr. Mao spoke of a future Beijing-Tianjin-Tangshan hydrogen highway. With populations of 14 million in Beijing and 11 million in Tianjin, there are about 4 million cars in the area. He favors hydrogen internal combustion engine and blended hydrogen-natural gas vehicles in the near term.

The amount of fuel cell and hydrogen research at the many universities around the country is impressive. Wuhan University of Technology's State Key Laboratory of Advanced Technology for Materials Synthesis and Processing, created by the Ministry of Science and Technology (MOST) has well over 100 students and professors engaged in fuel cell membrane, catalysis and electrode assembly research, with state of the art diagnostic and test equipment. There are a total of 35 institutions of higher education in Wuhan. A concentration of related hydrogen and fuel cell research is also evident in the 5-year program-supported universities in Shanghai and Beijing, as well as other regions. Wuhan's fuel cell research is supported significantly by Hubei province (of which Wuhan is the capital) and the city of Wuhan itself, with an eye on regional research interests and economic develop-

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NHA President Jeff Serfass stands with David (Wei) Dai from WHUT's Fuel Cell Group next to Wuhan University's fuel cell-powered Citroen.

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ment with new businesses. Within the region they have hydrogen production at the largest steel company in China, Wuhan Iron and Steel Co, significant hydroelectric power (Three Gorges Dam, for instance) for electrolytic production of hydrogen, and the region is an automobile manufacturing center (Citroen, Hyundai, Nissan, Dongfeng, for instance) so there is reason to expect development synergies that might make Wuhan a future center for expanded transportation research, demonstrations and manufacturing. Indeed, the university itself is spinning off a manufacturing company for fuel cell components and is home to a separate Automobile Engineering School. Also, Wuhan plans a 20 mini-bus and automobile hydrogen test program from 2006 to 2010 with three fueling stations.

Wuhan University of Technology's Fuel Cell Key Laboratory was founded in 2005 from the 5-years of experience in the State Key Laboratory mentioned above. Wuhan University of Technology itself has 38,000 students and was formed only in 2000 out of several predecessor educational units. Main research fields include fuel cell modeling, controllers and materials including catalyst coated membranes for which they have created a continuous product line and have applied the products in 25 and 50 kW fuel cells. With Dongfeng Motor Co, they have created a fuel cell vehicle from a Citroen, with a 25-kW stack and nickel metal hydride battery for hybrid operation, and have also produced a small fuel cell bus with Dongfeng.

Beijing SinoHytec Co is another university related technology company with interests in hydrogen, in this case related to the New Energy Vehicle Engineering Center of Tsinghua University and supported by the Ministry of Science and Technology of China (MOST) and the city of Beijing. SinoHytec has been developing city buses to operate on hydrogen fuel cells, as well as CNG and hybrid buses. The Beijing International Hydrogen Park is developing as a research and demonstration venue and will also provide a hydrogen fueling station to service vehicles during the Beijing 2008 Olympics. Many other companies are emerging to participate in the growing hydrogen and fuel cell research and product development business.

The depth of hydrogen-related research in China may be best indicated by some of the topics presented at this conference:

- Photocatalysis systems for water splitting
- Ethanol reforming for hydrogen production
- New hydrogen-producing anaerobe for use with activated sludge
- Low cost electrocatalysts
- Gasification of coal with wastes to produce hydrogen
- Thermochemical hydrogen production from biomass
- Analysis of hydrogen from lignite in supercritical water
- Plasma hydrogen production
- Hydrogen from cellulosic biomass fermentation
- Hydrogen from fermented organic wastewater
- Photobiological hydrogen production
- Safety analysis of a liquid hydrogen release
- Hydrogen storage materials including carbon nanotubes
- Gas diffusion layer durability of PEM fuel cell
- Modeling and control of PEM fuel cells
- Fuel cell testing standards
- Combined cooling, heat and power with high temperature fuel cells

Mr. Serfass closed his remarks in Wuhan presenting areas of collaboration among U.S. and Chinese researchers, companies and government agencies. The figures of his slides *(see below)* captured the joint work possibilities. Although his resources and contacts are limited, he will continue to expand his contacts in China and would welcome the opportunity to assist in creating a sharing of information and collaboration in research and demonstrations.