



Scott Slyfield fuels a forklift using the Hyhauler Plus which converts water to hydrogen. See story below.

AROUND THE INDUSTRY

Device Turns Water into Hydrogen Fuel

The new Hyhauler Plus at Robins Air Force Base in Georgia converts water into hydrogen using an onboard electrolyzer. The relatively lightweight – about 9,500lb – trailer-mounted system can produce 2kg of hydrogen per day and store up to 40kg in 20 carbon fiber-wrapped, fiberglass-coated tanks.

The Quantum Technologies-produced trailer was delivered to Robins on May 14 and will serve as the primary hydrogen source until the base's permanent, fixed station is completed in December.

The Hyhauler Plus was developed under Army specifications for deployment to forward locations. The unit clearly satisfies the Air Force's alternative energy objectives, says Mike Mead, head of APTO.

NanoDynamics Names Ruberto President

NanoDynamics Energy Inc. of Buffalo, New York, has named John Ruberto as president. He will be responsible for the commercialization of the company's Revolution™ micro-tubular solid oxide fuel cells.

Ruberto most recently served at Applied Nanotech as Sr. V.P. of programs, expanding the company's intellectual property portfolio, backlog and revenue generation. Prior to that he was president of power at Eagle Picher.

"Ruberto joins our team at an exciting point in the company's history, as we move into applying our solid oxide fuel cell technology's unique capabilities against viable market applications," says Keith Blakely, CEO of NanoDynamics. "His extensive experience overseeing strategic growth in both commercial and military markets will be a great resource for our organization."

MTI Micro Expands Operations Into China

MTI MicroFuel Cells Inc., the developer of Mobion® off-the-grid portable power solutions, will expand its operations into China with the opening of a new representative office in Shanghai. The new office will facilitate MTI's efforts to develop relationships with manufacturers and low-cost component suppliers in China.

"Expanding our operations in China is an important step in achieving manufacturing readiness," says Peng Lim, chairman and CEO of MTI.

The opening of the office follows the company's appointment of new business representatives in Korea and Japan. The China office will also work to develop new partnerships and help strengthen ongoing OEM relationships. MTI hopes to sign a contract with a low-cost manufacturing partner by the end of this year.

Verizon Earns Award for Fuel Cell Facility

Verizon has earned the U.S. government's Energy Star Award for operating the nation's largest fuel cell site of its kind – a call-switching center in Garden City, New York. In operation since 2005, the facility uses seven fuel cells from UTC Power of South Windsor, Connecticut. Each generates 200kW per hour, enough to supply 400 single-family households.

The existing commercial power grid, fuel cells, and existing Verizon backup power work together to meet the



facility's operational needs. Natural gas is piped in from local gas company Keyspan to obtain the hydrogen atoms. The natural gas is not burned. Instead, the hydrogen atoms are detached from the gas as it is fed into each fuel cell, and then combined with oxygen atoms from the air to generate direct current electrical power.

When all seven fuel cells are activated, this system provides 80% of the facility's power load. Heat and water are then removed from each cell, and the direct current is converted to alternating current electricity for use in the building. Waste heat created by the fuel cells generates 75% of the energy to heat the facility and one-third for cooling.

DMFCC Receives Order for Formic Acid Cartridges

VIASPACE Inc.'s Direct Methanol Fuel Cell Corp. (DMFCC) subsidiary has received an order from Lynntech

Inc. of College Station, Texas to design and produce formic acid fuel cell cartridges.

This work is under a U.S. Army development contract in which the Army plans to use Lynntech's fuel cell combined with technology developed at Vanderbilt University to create a fuel cell system that has a minimum of moving parts and support structure to produce the complete power supply.

"Our design team will design the fuel cell cartridge, pouch, and valve for a formic acid fuel cell, which will involve selection and testing of new materials suited to formic acid," says Dr. Carl Kukkonen, CEO of VIASPACE and DMFCC. "Formic acid is one of the liquids covered by our extensive license on fuel cell patents from Caltech, and it is also one of the types of fuel cells recently approved by the Department of Transportation for crew and passengers to carry on board commercial aircraft."

DuPont and SFC Develop Portable Power System

The M-25 portable fuel cell, which combines DuPont's direct methanol technology with SFC Smart Fuel Cell AG's commercially proven fuel cell systems, products, and integration expertise, has been deployed for its first limited use in the field for the U.S. Army.

The M-25 is up to 80% lighter than conventional power sources, yet is capable of powering a wide range of soldier equipment, such as communication and navigation equipment. In addition, it delivers quiet and continuous energy, and offers independent stand alone function such as remote area battery charging and power.

"The M-25 could revolutionize wearable portable power sources in the field by extending soldier-mission times to 72 hours and beyond," says Col. Richard Hansen, project manager, Soldier Warrior, U.S. Army.

Ceci Becomes Power Air CEO

The board of directors at Power Air Corp. of Livermore, California, has named Donald Ceci, VP of sales and marketing, as the company's new president and CEO. Ceci will replace H. Dean Haley, Power Air's chairman, COO and acting CEO.

"Ceci has intimate knowledge of our technology, competitors, markets, target products, personnel and operations. I'm delighted to be turning the helm over to him and expect that he will have marked impact on the ongoing success of our company," says Haley.

Prior to joining Power Air, Ceci spent over 20 years overseeing and directing sales and marketing activities for IBM, Philips, Comdisco, Ricoh and Ballard Power Systems

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Managing Editor: Josephine Chesworth
 Technical Editor: Dr. E. Thomas Chesworth
 Circulation Manager: Patrick D. Elliott
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Inc. As director of sales at Ballard, he built the sales and service organizations required to support the commercialization of transportation and power generation fuel cell powered systems that were being developed by the company.

CMR Fuel Cells Signs MoU with Asian ODM

CMR Fuel Cells Plc of Cambridge, U.K. has signed a memorandum of understanding with Asian Original Design Manufacturer to co-develop a fuel cell charger system for notebook computers. Per the agreement, the companies will work together in the design and development of a stand-alone, hybrid direct methanol fuel cell charger intended for consumer use.

CMR is a long-term member of Intel's Extended Battery Life Working Group which focuses on realizing an eight hour working day away from mains electricity.

Sharp Achieves Higher Power Density for DMFCs

Sharp Corp. has achieved a 0.3W/cc power density for direct methanol fuel cells for mobile equipment. The use of this technology can make it possible to develop fuel cells that have almost the same volume but a longer continuous-use lifespan than Li-ion batteries, which are the main type currently in use.

Giving special attention to the power generation part's stack structure, Sharp has developed the three-dimensional highly integrated stack structure through the use of thin cells made by microfabrication. This structure can be created by the alternate lamination of reed-shaped thin cells arranged in parallel at fixed intervals and reed-shaped (porous) spacers, with the cells and spacers running perpendicular to each other like a grid. With this structure, uniform and continuous spaces are secured, making it possible to increase the cell surface area per unit volume and smoothly circulate the air that is one of the sources for power generation.

HydraStax Receives Order for 500 Fuel Cells

American Security Resources Corp. subsidiary Hydra Fuel Cell Corp. has received an order for 500 HydraStax fuel cells from Personalized Power Systems, a Boca Raton, Louisiana-based residential generator dealer.

Jim Twedt, president and CEO of Hydra says the company now has a backlog of over \$11,000,000, and this highlights the viability of fuel cells as an alternative power source. "This order is further evidence of the significance fuel cells will have in freeing America from hydrocarbon dependence in electric generation," he commented.

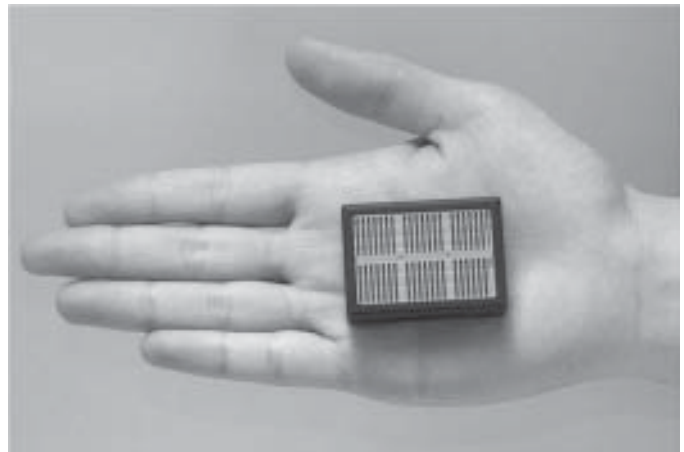
Quantum Awarded Powertrains Contract

Quantum Fuel Systems Technologies Worldwide Inc. of Irvine, California, has been awarded a contract by EDAG Engineering + Design AG to develop advanced hybrid vehicle powertrains for the Future Steel Vehicle program sponsored by World Auto Steel, the automotive group of the International Iron and Steel Institute (IISI).

Quantum will design, analyze, and develop hybrid vehicle powertrain architectures, i.e., advanced plug-in hybrid electric vehicles and hydrogen fuel cell hybrid vehicles. Quantum will work with Advanced Lithium Power Inc. of Vancouver, British Columbia, Canada, to develop the advanced Li-ion battery system and controls for each of the vehicle architectures.

Sony Debuts Palm-Sized Fuel Cell

At the Small Fuel Cells 2008 conference in Atlanta, Georgia in May, Sony debuted its palm-sized fuel cell with a tiny frame measuring just 50 x 30mm.



Sony's fuel cell uses methanol as its main source of fuel, and uses a regulator or a pump in controlling fuel supply, making it an active fuel cell system. In spite of the apparent dependence on methanol though, the device has a hybrid design and is equipped with an auxiliary Li-ion battery, DMFC array, and a control circuit, aside from the previously mentioned fuel regulator. It exhibits a hybrid mechanism – the primary source of fuel is supplemented with the power coming from the li-ion battery.

Sony's fuel cell prototype can cope with mobile devices' rising peak powers with its maximum instant output of 3W. Sony didn't give more details about the device, although the fuel cell can reportedly power 14 hours of 1-seg TV viewing using just 10ml of methanol.

Panasonic EV to Double Fuel Cell Output

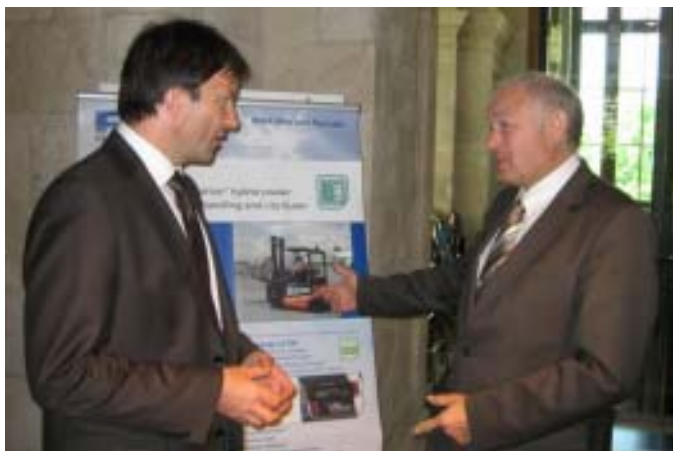
The Yomiuri Shimbun reports that Panasonic EV Energy Co. plans to double production of fuel cells for hybrid cars to 1 million units annually by 2011.

The company, formed jointly by Toyota Motor Corp. and Matsushita Electric Industrial Co. to develop and produce hybrid car batteries, will ramp up output at its plant in Kosai, Shizuoka Prefecture, Japan. It also is considering building a new factory in the Tohoku region.

The firm plans to build another factory in Kosai to begin mass production of Li-ion batteries in 2010, in line with the expected market entry of plug-in hybrid cars.

Proton Motor Receives Innovation Award

Proton Motor of Puchheim, Germany, recently received the Bavarian Innovation Award for its triple-hybrid drive. During an event in the hall of the Bavarian State Chancellery, Proton Motor's CEO Felix Heidelberg received the award from Prime Minister Beckstein. The award is one of the most highly remunerated in Germany.



Among more than 100 nominations, Proton Motor's triple-hybrid technology was chosen as one of the best of 11 proposals. This technology offers a 30% to 60% energy savings for stop-and-go operated vehicles such as fork lift trucks or city buses. The control of optimum energy flow between fuel cell, battery and super capacitor is achieved by an intelligent power management. The braking energy accumulated while stopping is saved in the storage systems battery and super capacitor and can be used on demand.

SymPowerco's Fuel Cell Hybrid Prototype

SymPowerco Corp. of Las Vegas, Nevada, has released development details of its prototype fuel cell and

hybrid power systems. The systems are located in the laboratories of the Mechanical and Aerospace Engineering Department at Carleton University in Ottawa, Canada.



The 5W fuel cell stack consists of a series of five flowing electrolyte direct methanol fuel cells that provide power to a hybrid power system. The fuel cell stack maintains the charge on the power system's batteries while the batteries supply power to a variable load. The fuel cell subsystems include the methanol and electrolyte recirculation and control systems and a secondary fuel cell that removes methanol from the recirculating electrolyte.

Also included in the fuel cell system is an advanced System Control and Data Acquisition (SCADA) system designed exclusively for SymPowerco's fuel cell program. The SCADA system has sufficient capability for all anticipated phases of the program and will serve as the basis of the company's commercial SCADA designs.

European Council Adopts JTI Regulation

The Industry Grouping of the Joint Technology Initiative on Fuel Cells and Hydrogen, New Energy World IG, has adopted the Council Regulation creating the Fuel Cell and Hydrogen Joint Technology Initiative (FCH JTI). The regulation was adopted on May 30 by the European Unions Competitiveness Council.

Between 2008 and 2017, the FCH JTI will have a budget of •1 billion with investment shared by its two founding members, the European Commission and NEW IG. The FCH JTI will run until 2017 and will drive the technology towards commercialization in the next decade.

Further details on the content of the JTI program and structure are expected at the official launch during the

General Stakeholders Assembly in Autoworld in Brussels on October 14th and 15th.

EU to Research Fuel Cells, Hydrogen

In June, European governments agreed to spend •470 million (\$731 million) developing fuel cells and hydrogen technology for cars, reports the *Associated Press*.

Car and energy companies such as Daimler AG and Royal Dutch Shell PLC are expected to match or exceed the EU funding for the six-year research project that should speed up research and make cleaner cars a commercial reality between 2010 and 2020.

The EU says hydrogen cars could cut the amount of oil used by road transport by 40% by 2040 and halve carbon emissions by 2050.

“The break-even point could be most likely reached between 2025 and 2035,” it said. “European industry needs additional stimulation to invest in the technology.”

Hydrogen-powered fuel cells are in limited use in place of fossil fuels, but they are neither efficient nor inexpensive enough for widespread use.

Heliocentris Granted Service Contract by Ballard

Fuel cell integrator Heliocentris Fuel Cells AG of Berlin, Germany, has a new agreement with strategic partner Ballard Power Systems (Canada), a world leader in clean energy fuel cell products. Under this new agreement Ballard has transferred the post-warranty technical customer service for its Nexa power modules to Heliocentris.

Ballard has granted Heliocentris worldwide rights to operate as the technical customer service provider for Ballard’s Nexa power modules. Heliocentris will be the contact point for all previous and new customers, both industrial and academic, throughout the world.

“This arrangement is validation of our servicing capabilities based on more than 10 years experience in marketing fuel cell systems,” said Dr. Henrik Colell, CEO of Heliocentris Fuel Cells AG.

Oorjapac Fuel-Cell Battery Charging System

FMC Technologies Automated Systems has successfully implemented an onboard methanol-based fuel-cell battery charging system on an automated guided vehicle. The system, Oorja Protonics’ OorjaPac, charges the battery while the vehicle is in operation and when it is parked.

OorjaPac provides greater AGV utilization and improved operational productivity through the elimination of downtime needed for charging or battery swapping.

Operating results showed that only five gallons of methanol were needed to power the AGV for 24 hours. When refueling is required, it takes less than three minute.

FMC Technologies continues to work on other green solutions for its AGV customers, including a current project in which FMC is installing a 12-vehicle AGV system powered by hydrogen- based fuel cells.

Canon Applies for Camera Fuel-Cell Patent

PC Magazine reports that Canon has applied for a fuel cell patent for its DSLR camera, the technology of which could be used for other portable devices as well.

The patent applied for addresses some of the most problematic issues with fuel cells, including fluctuating current and uneven gas densities.

Canon will create not a one fuel cell system, but a system with multiple fuel cells. The fuel cells have different voltage outputs which can be matched depending upon the requirements of the device, hence creating the perfect voltage for a gadget.

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*Compiled by Eddie T. Seo
email: etseo@netway.net
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Meeting Report

Small Fuel Cells 10th Annual Conference Tampa Marriott Waterside Hotel and Marina Atlanta, Georgia April 30 - May 2, 2008

By David Edlund

*Vice President, PEM & Reformer System
Development
Protonex Technology Corp.*

The Knowledge Foundation sponsored the Small Fuel Cells 2008 Conference from May 1 through May 2 in Atlanta, Georgia. This was the 10th annual meeting and it was attended by about 190 persons representing governments, academia, and industry. A total of 24 oral papers were given by presenters from North America, Europe, and Asia. In keeping with past years, the conference was preceded on April 30 by a one-day seminar on fuel cell and battery hybrid technology.

The technical program for the conference covered the major aspects of small-scale fuel cell technology and applications. PEMFC, SOFC, and DMFC technology received the majority of attention. However, there was clearly an emphasis on commercial activities, and one paper in particular (given by **Carl Kukkonen**, Direct Methanol Fuel Cell Corp., a Viaspace company) addressed fuel cartridges and distribution.



David Edlund, vice president of PEM & Reform Systems Dev., Protonex Technology Corp., spoke at this year's conference.

Terry Payne (U.S. Department of Energy) presented an overview of his agencies PEMFC programs. Motivated by the promise of better vehicle fuel efficiency, a significant reduction in emissions of carbon dioxide, and improvements in run time over conventional battery solutions, the U.S. Department of Energy remains very active in supporting fuel cell R&D as well as public awareness programs. However, while Dr. Payne conceded that the Department of Energy is primarily focused on fuel cells for automotive propulsion, this work has lead, indirectly, to developments that advance PEMFC systems for low-power applications: for instance, MEA development especially with respect to increased durability under adverse (as in dry) conditions.

Elizabeth Ferry (Research, Development & Engineering Command, U.S. Army) discussed how small fuel cell systems may be expected to mature from laboratory



Bill Eggers, president (middle) and John Stonewald (right) of Bio-Logic USA, LLC visit with Anja Bieberle-Hütter of ETH Zurich.

test articles to field-deployed hardware for the U.S. Army. Recognizing that technological maturity is still a challenge for small fuel cell systems, Ferry discussed many specific requirements that will have to be met by fuel cell systems in order to advance in degree of technical readiness prior to being fielded. In particular, reference was made to Mil-Std 810F requirements. Although military-specific, some of the 810F requirements dealing with safe operation are prudent for non-military applications as well; for instance, the maximum allowable external case temperature.

Developing work addressing the direct consumption of ethanol in a PEM-type fuel cell (DEFC) was presented by **Dr. Carsten Cremers** (Fraunhofer Institute for Chemical Technology). Although it is tempting to think that low-toxicity is a potential advantage of using ethanol as a fuel, Cremers pointed out that tax laws are such that

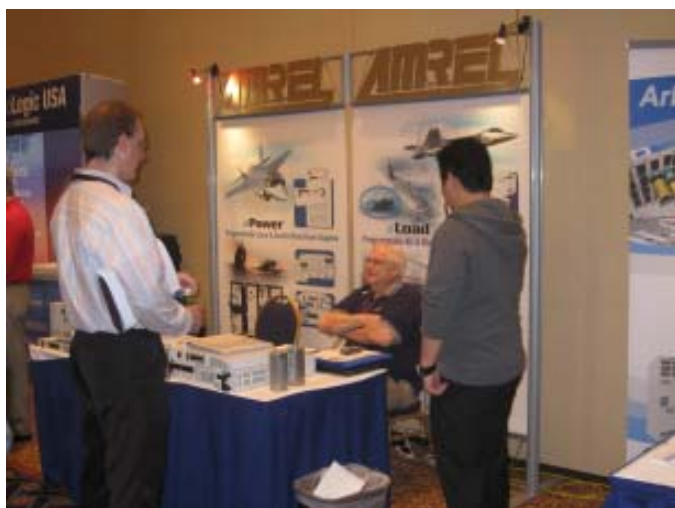


Charles Wicker talks with visitors to MTI MicroFuel Cells Inc.'s booth.



MyFC AB's Björn Westerholm (middle) and Anders Lundblad (right)

denaturing agents are added to fuel-grade ethanol specifically for the purpose of rendering the fuel unsuitable for consumption. Understanding what these denaturing additives are, and how they interact with the electrocatalyst on the MEA, is subject of ongoing work. However, Cremers reported that a common commercial denaturing agent (denatonium benzoate, sold under the trade name Bitrex®) is completely unsuitable as it rapidly poisons the anode catalyst. The reported energy density for ethanol fuel is between that for methanol and sodium borohydride (methanol having the lowest gravimetric and volumetric energy density). In acidic solutions, platinum-tin anode catalysts were found to have higher catalytic activity than either platinum-ruthenium or pure platinum. Nevertheless, platinum loadings remain high at about 2mg/cm² (anode) and 2-3mg/cm² (cathode).



Ron Zimm of AMREL American Reliance (middle).

Sony and Samsung presented back-to-back presentations on their respective small-scale DMFC programs. Sony's micro-DMFC system is reported to have a dry weight of about 50g and will deliver slightly more than 3W through hybridization with a lithium-ion battery. The fuel cell output is limited to just over 1W. Target applications include mobile phones, mobile game controllers, digital cameras, and Sony's Walkman. In contrast, Samsung is targeting PC applications and a correspondingly higher power output (12W). A large amount of durability test data was presented to emphasize stable performance (over a test period of 600 hours) and orientation independent operation.

With a focus on DMFC applications, **Dr. Hanna Rajante** (Johnson Matthey Fuel Cells) discussed the



Will Lovell promotes Arbin Instruments.

investigation of porous-carbon monoliths as a combined flow field and gas-diffusion layer. Expected advantages include increased volumetric density for a DMFC stack and improved manufacturability (the carbon monoliths are extruded through a die, with the flow fields formed by the enclosed channels of the monolith). A 2W demonstration device was made based on a simple "air-breathing" design.

A rather unusual PEMFC architecture for portable consumer electronics was presented by **Allison Fischer** (Motorola Labs). Dr. Fischer described a PEMFC system occupying only 8 cm³ and consisting primarily of a battery (2 cm³), a super capacitor (1 cm³), a fuel cell (1 cm³), and fuel (hydrogen; 4 cm³). The fuel cell appears to be planar, but when viewed under magnification it consists of a close-packed array of short cylinders. The cylinder wall is the electrolyte (Nafion). The internal cylinder surface becomes



Stephen Barlow, CCO of CMR Fuel Cells (middle).

the anode and the external cylinder surface becomes the cathode. Current collection is via a gold-foam matrix that fills all internal and external voids around the array of cylinders. Fabrication of this three-dimensional fuel cell has been difficult, but the first report of fuel cell performance is expected soon.

An interesting paper from Europe demonstrated that not all effort aimed at fuel cell systems for portable consumer electronics is limited to direct alcohol systems and PEMFC systems. **Dr. Anja Bieberle-Hütter** (ETH Zürich) presented details of her group's development of a reformed-butane SOFC system (the "ONEBAT" project). Because the fuel cell stack and reformer are very small in size, a small amount of insulation is reported to be very effective at managing thermal losses. The fuel cell is planar, incorporating an LSCF electrolyte layer, and is fabricated on a Foturan glass-ceramic substrate using conventional photolithography and deposition techniques.

There were a collection of papers addressing commercialization of small-scale fuel cell systems and components including hydrocarbon membranes (PolyFuel Inc.); surveillance systems (EnerFuel Inc.); rechargeable hydrogen storage (Ovonic Hydrogen Systems LLC); and fuel cartridges (Direct Methanol Fuel Cell Corp.). However, perhaps the best example of commercial fuel-cell success was presented in the paper by **Dr. Jens Müller** (SFC Smart Fuel Cells). SFC has sold more than 8,000 commercial DMFC systems (almost 4,500 in 2007 alone) and currently product sales account for 75% of total revenue. Surprisingly, Dr. Müller reports that SFC does not make any of the components used in its DMFC products. To underscore SFC's focus on commercial sales, Dr. Müller pointed out that the company maintains over 1,000 points of sale for systems and fuel in Europe, and that the EFOY product carries a commercial warranty of three years/3,000 hours of operation.

This 10th anniversary of the Small Fuel Cell conference provided a good forum to meet colleagues and to learn of recent development work in the field.

RESEARCH AND DEVELOPMENT

New Catalyst Makes Fuel Cells More Efficient

Dr. José E. Barranco focused on the need for new catalysts when he presented his PhD thesis, *Development of New Metallic Materials of an Amorphous Nature* for use in direct methanol fuel cells, at the University of the

Basque Country (UPV/EHU) in Spain. After investigating the composition of numerous metals, Barranco made alloys that reduce the platinum to 1%. Composed of elements such as nickel, niobium, antimony or ruthenium, these alloys efficiently convert molecules of carbon monoxide (CO) into carbon dioxide (CO₂). Being gaseous, the CO₂ does not adhere to the catalyst which in the long term favors the catalytic process.

This means that the methanol fuel cell will emit a small quantity of CO₂ which, according to Barranco, is easily tolerable by nature given that this can be incorporated into the photosynthesis cycle of plants. An American Methanol Institute study forecasts that by 2020 there will be 40 million cars powered by methanol fuel cells, reducing the CO₂ emissions by 104 million tons.



Once the suitable catalyst was found, Barranco set out to increase its efficiency. The conclusions of his thesis point to the fact that, if the platinum alloy is structured amorphously, its electrical conduction properties are enhanced and it undergoes less corrosion (advantages for the medium in which it has to operate). Moreover, it has an operational capacity 80-100 times greater than platinum in a crystalline structure. Amorphous materials are those with a disordered molecular structure and which, in this case, are obtained by the sudden cooling of metal alloys.

Mini-Helicopters with Fuel Cells

ScienceDaily reports that together with colleagues at the Technical University of Berlin, researchers from the Fraunhofer Institute for Reliability and Microintegration IZM in Berlin have developed a fuel cell that weighs only 30gm and has an output of 12W.

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Dr. S.P. Wolsky, Florida Educational Seminars, Inc.

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The 2008 Seminar had more than 500 attendees from around the world.

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Send Paper abstract to Dr. A.H. Taylor, tayloralwyn@comcast.net

Poster abstract to Dr. Shep Wolsky, ansum@aol.com

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The high power density of 400W/kg has so far only been achieved in considerably larger systems weighing several hundred grams. The cell is light enough to power a 20cm helicopter. It is being developed by the participants in an EU project, and will be used in future for missions such as locating victims trapped in fallen buildings, monitoring traffic or investigating tracts of land that have been contaminated by chemical accidents.

“We use very thin, planar fuel cells,” explains IZM team leader Dr. Robert Hahn. “We have replaced the metal plates by lightweight plastic spacers.”

The researchers have no need for an additional pump to provide an adequate air supply. The wind generated by the helicopter’s rotor blades goes directly into the air vents. Since the helicopter always needs about the same amount of energy to stay in the air, the reactor always has to produce a consistent quantity of hydrogen. The researchers have already built a prototype of the lightweight fuel cell.

PRODUCT NEWS

Fuel Cells – Global Strategic Business Report

This report analyzes the worldwide markets for fuel cells in millions of US\$. The major product segments analyzed are phosphoric acid fuel cells, molten carbonate fuel cells, alkaline fuel cells, solid oxide fuel cells, and proton exchange membrane fuel cells. The report provides separate comprehensive analytics for the U.S., Canada, Japan, Europe, and the rest of the world. Annual forecasts are provided for each region for 2003 through 2012.

Profiles of 182 companies include Acumentrics Corp., Ansaldo Fuel Cells SpA, Apollo Energy Systems Inc., Areva Group, Arotech Corp., Astris Energy Inc., Axane Fuel Cells, Ballard Power Systems Inc., Ball Aerospace & Technologies Corp., BCS Fuel Cells, Ceramic Fuel Cells Ltd., Ceres Power Holdings Plc, CFC Solutions GmbH,

Distributed Energy Systems Corp., Electro-Chem-Technic, Fuel Cell Technologies Ltd., Hydrogenics Corp., IdaTech LLC, Mitsubishi Heavy Industries Ltd., Morgan Fuel Cells, MTI MicroFuel Cells Inc., Nuvera Fuel Cells, Plug Power Inc., Quantum Fuel Systems Technologies Worldwide Inc., ReliOn Inc., RWE Fuel Cells GmbH, SFC Smart Fuel Cell AG, Siemens Power Generation, Teledyne Energy Systems Inc., UTC Fuel Cells, and Voller Energy Group Plc.

Visit www.researchandmarkets.com.

Fuel Cells Catalyst and Components Brochure

Alfa Aesar, a Johnson Matthey company, has published a new *Fuel Cells Catalysts & Components* brochure.

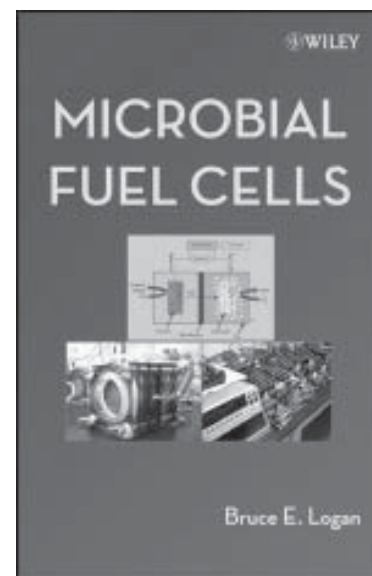
HiFUEL catalysts are specially formulated for PEM fuel cells and are made to a consistently high quality on a commercial scale. HiFUEL catalysts and gas treatment products are ideal for use in fuel cell and other distributed hydrogen product applications. Additional fuel cell components are also available, including Nafion® membranes, Toray™ carbon paper, cathodes and anodes, and Membrane Electrode Assemblies (MEAs).

For more information, visit www.alfa.com.

Microbial Fuel Cells

Microbial Fuel Cells is the first book dedicated to microbial fuel cells (MFCs). It serves as an introduction to the theory underlying the development and functioning of MFCs as well as a manual for ongoing research. Author Dr. Bruce Logan, a leading pioneer in MFC research and development, also provides practical guidance for the effective design and operation of MFCs based on his firsthand experiences.

This book covers everything you need to fully understand MFCs. Key topics include voltage and power generation, MFC materials and architecture, mass transfer to bacteria and biofilms, bioreactor design, and fundamentals of electron transfer. Applications span a wide variety of scales, from power generation in the laboratory to approaches for using



MFCs for wastewater treatment. The role of MFCs in the climate change debate is examined. Detailed illustrations of bacterial and electrochemical concepts are included. Charts, graphs, and tables summarize key design and operation variables.

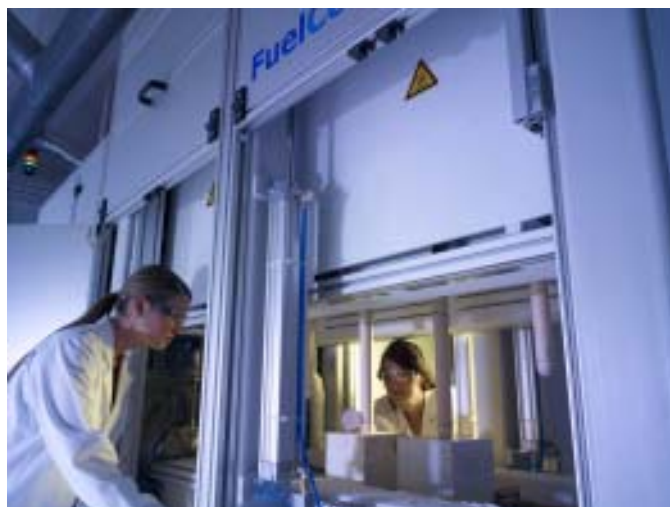
This 216-page hard cover book (ISBN: 978-0-470-23948-3) is available for purchase at www.wiley.com.

FuelCon Sintering Test Station Optimizes Production

FuelCon is one of the first companies to introduce manufacturing-scale sintering test stations for optimizing the production of SOFC stacks.

The sintering process is a critical manufacturing procedure in which several ceramic MEAs are interconnected and fixed in place to form the SOFC stack. It requires accurate control and management of the anode and cathode gas flow, as well as precise control of the gas composition, temperature and mechanical pressure. To assure high production throughput and optimal stack performance, the parameters during this procedure must be precisely defined and controlled as well as reproducible.

Special electrochemical analytic tools enable a significant reduction in the assembly process and also allow the operator to evaluate the quality and performance



parameters of the stacks, and therefore optimize stack manufacturing throughput. The editable process scripts keep the sintering process parameters confidential and ensure the protection of proprietary information. FuelCon offers additional options allowing the simultaneous sintering of up to four stacks and/or the controlled cooling of the sinter furnace.

For more information, visit www.FuelCon.com.

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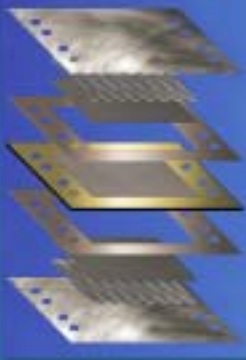
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ELECTRIC VEHICLES

Honda Begins Production of FCX

Honda Motor Co. Ltd. has begun production of its new FCX Clarity fuel cell vehicle and the first vehicle (U.S. specification) rolled off the line on June 16.

The FCX Clarity is produced at the Honda Automobile New Model Center in Takanezawa-machi, Shioya-gun, Tochigi Prefecture, Japan. A new dedicated fuel cell vehicle assembly line was established, including unique fuel cell vehicle processes such as the installation of the fuel cell stack and hydrogen tank. The fuel cell stack is produced at Honda Engineering Co. Ltd. in Haga-machi, Haga-gun, Tochigi Prefecture, Japan. Exclusively designed automated equipment was introduced to ensure high precision quality while enabling mass production of cells, with several hundred cells required for each fuel cell stack.



The FCX Clarity was designed as a dedicated fuel cell vehicle and is powered by the highly compact, efficient and powerful Honda V Flow fuel cell stack. Lease sales are scheduled to begin this month in the U.S. and this fall in Japan. The combined sales plan calls for a few dozen units within a year and about 200 units within three years.

VW's Tiguan Fuel Cell Concept

Volkswagen's Tiguan HyMotion concept features a fuel cell system integrated in the engine compartment capable of 107 horsepower. With assistance from the electric motor, the Tiguan HyMotion advances to 134 horsepower. The vehicle's top speed is 93 mph and it accelerates from 0 to 60 mph in about 14 seconds.

A lithium ion battery with a charge capacity of 6.8Ah serves as an auxiliary energy storage device with a 22kW maximum power output. The battery is charged by



recovered braking energy (recuperation) or by the fuel cell. The battery system is installed in the trunk beneath the dual cargo floor available on the production Tiguan. A 700 bar hydrogen tank was integrated in the area beneath the floor in the rear bench seat and cargo area. It can hold up to 3.2 kilograms of hydrogen.

UPCOMING EVENTS

Meetings and Symposia

July 7-10 – 43rd Power Sources Conference, Sheraton Philadelphia City Center Hotel, Philadelphia, Pennsylvania.

Includes advanced materials and processes; aqueous batteries; battery safety/quality/testing; fuel cells, fuel processing and storage; hybrid and alternate power systems; molten salt batteries; capacitors; polymer batteries and solid-state technologies; lithium and lithium-ion batteries; and metal-air batteries.

Info: Palisades Convention Management Inc., 411 Lafayette St., New York, NY 10003, phone: (212) 460-8090, or visit www.powersourcesconference.com.

September 4-5 – Battery Power 2008, Astor Crowne Plaza, New Orleans, Louisiana.

Features battery safety standards and regulations; battery cost and performance; industry roadblocks; global activity from OEMs; and hands-on product demonstrations.

Info: Visit www.batterypoweronline.com/bp08_workshop.htm.

September 14-18 – INTELEC 2008, Town & Country Resort and Convention Center, San Diego, California.

Examines the latest research and developments in power electronics and telecommunications power systems, including batteries and alternative power (fuel cells, engines, etc.). Exhibition features products and equipment.

Info: Visit www.intelec.org.

September 17-19 – International Congress for Battery Recycling, Intercontinental Hotel, Dusseldorf, Germany.

Includes developments in rechargeable battery

technologies; new lithium-based systems; legislation; battery collection; recycling plants and processes; and plant tours.

Info: ICM AG, Schwaderhof 524, 5708 Birrwil, Switzerland, phone: +41 62 785 10 00, or visit www.icm.ch.

September 23-26 – 11th European Lead Battery Conference, Hilton International Hotel, Warsaw, Poland.

For those involved in lead-acid battery developments, manufacturing, marketing, use and financing. Topics include manufacturing cost reduction, technical developments, production methods, markets, and new business ventures.

Info: Visit www.ldaint.org/11ELBC/11elbc.html.

October 8-9 – Fuel Cells Science & Technology 2008: Scientific Advances in Fuel Cell Systems, Confederation of Danish Industries, Copenhagen, Denmark.

Part of the Grove series of events, topics include fuel cell membranes, fuel processing, materials, modeling, fuels for fuel cells and cell and stack technology.

Info: Janet Seabrook, Fuel Cells Science & Technology 2008 Conference Secretariat, Elsevier, The Boulevard, Kidlington, Oxfordshire, OX5 1GB, United Kingdom, phone: +44 (0)1865 843691, or visit www.fuelcelladvances.com.

October 22-23 – H2Expo, Congress Centre Hamburg, Hamburg, Germany.

Conference and trade fair on hydrogen and fuel cell technologies includes transport, infrastructure and hydrogen. Previous show included 70 speakers from four continents.

Info: Hamburg Messe und Congress, Project Team H2Expo Rentzelstr. 70, 20357 Hamburg, Germany, or visit www.hamburg-messe.de.

October 8-10 – Batteries 2008, Nice French Riviera, France.

In its 10th year, international exhibition and conference gathers 400 attendees, 40 booths, and 60 speakers. Topics include R&D, products, HEVs, marketing, raw materials, nano/micro batteries, and recycling.

Info: BCA - Batteries 2008, 38 rue Anatole France, 92594 Levallois-Perret, Cedex, France, phone: +33 (0) 1 70 94 65 22, or visit www.batteries2008.com.

October 27-31 – 2008 Fuel Cell Seminar & Exposition, Phoenix Convention Center, Phoenix, Arizona.

With 2,300 attendees from 36 countries, seminar includes technical leaders, researchers, scientists, fuel cell product manufacturers, developers, educators, and investors. Papers and exhibits focus on fuel cell advances.

Info: Fuel Cell Seminar Headquarters, c/o Courtesy Associates, 2025 M Street NW, Suite 800, Washington, DC 20036, phone: (202) 973-8671, fax: (202) 331-0111, or visit www.fuelcellseminar.com.

November 5-7 – 49th Battery Symposium in Japan, Rihga Royal Hotel Sakai, Sakai, Osaka, Japan.

Includes electrode reaction mechanisms; new battery materials; high power batteries; fuel cell developments;

and international session on science and technology of batteries, fuel cells and capacitors.

Info: Visit <http://battery.electrochem.jp/index-e.html>.

December 8-9 – Lithium Mobile Power 2008, Las Vegas Hilton, Las Vegas, Nevada.

Explore application-driven lithium battery development, materials, components, systems design and integration, electrode technologies, electrolytes, safety, degradation, and performance of mobile power applications.

Info: The Knowledge Foundation Inc., 18 Webster St., Brookline, MA 02446, phone: (617) 232-7400, fax: (617) 232-9171, or visit www.knowledgefoundation.com.

December 10 – Lithium Battery & Fuel Cell Hybrid Systems, Las Vegas Hilton, Las Vegas, Nevada.

Discover advantages of using lithium battery and fuel cell hybrid systems to accelerate the delivery of successful commercial applications.

Info: The Knowledge Foundation Inc., 18 Webster St., Brookline, MA 02446, phone: (617) 232-7400, fax: (617) 232-9171, or visit www.knowledgefoundation.com.

December 11-12 – Fuel Cells Durability & Performance, Las Vegas Hilton, Las Vegas, Nevada.

Interdisciplinary forum for developers, manufacturers and suppliers of fuel cell materials, stacks, system design, fabrication, and testing. Discusses real world solutions and innovations for durability and performance issues; testing systems; standards; and regulations significant to large scale commercialization.

Info: The Knowledge Foundation Inc., 18 Webster St., Brookline, MA 02446, phone: (617) 232-7400, fax: (617) 232-9171, or visit www.knowledgefoundation.com.

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