10th Annual International Conference

Small Fuel Cells(sm) 2008

Portable & Micro Fuel Cells for Commercial & Military Applications

April 30-May 2, 2008
Atlanta, GA USA

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10th Annual

Small Fuel Cells℠ 2008

PORTABLE & MICRO FUEL CELLS FOR COMMERCIAL & MILITARY APPLICATIONS

April 30-May 2, 2008

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Industry and academic scientists are encouraged to submit poster titles for this event. One-page abstracts (8 1/2" x 11" with 1-inch margins) must be submitted no later than **April 7, 2008** for inclusion in conference documentation. Additional poster submissions will be accepted until **April 25, 2008** but may not be included in conference documentation. Note: If you are submitting a poster, you MUST be registered and paid in advance to ensure that a posterboard is reserved for you.

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Fuel Cell & Battery Hybrid Systems

BUILDING SYNERGY TOWARDS COMMERCIALIZATION

April 30, 2008

SPECIAL ONE-DAY SYMPOSIUM AGENDA

Wednesday, April 30, 2008

9:15 Registration and Refreshments

10:00 Materials Challenges for the Next Generation Electrode Materials for Li-Ion Batteries and Hybrid Technology

Sanjeev Mukerjee, PhD, Professor, Director, Northeastern University Energy Research Center, Laboratory for Electrochemical Advanced Power, Northeastern University

This presentation will provide an overview of the current state of the art materials as applied for various Li-ion battery technologies including their increased use in small and medium scale portable devices to the present thrust towards safe, cheap and reliable HEV and PHEV applications. Prospects for new materials developments will be discussed from the purview of their structural and charge transfer characteristics. In addition advances in the arena of hybrid batteries in concert with other technologies such as fuel cell electrodes will be discussed. Transition to new materials formulation and synthesis enabling unique interfacial characteristics will be presented within the context of new technology initiatives.

10:30 Fuel Cell / Battery Hybrid Systems: Designing for a Moving Target

Jeremy Steinshnider, PhD, Group Leader / Product Development Senior Scientist, Lynntech, Inc.

This presentation will address the challenges and opportunities associated with designing fuel cell / battery hybrid power systems for applications with dynamic requirements. Topics to be discussed include various power management configurations, fuel cell dominant vs. battery dominant systems, pros and cons of off-the-shelf balance-of-plant components, and the pitfalls of designing for a moving target. Along the way, real world examples of existing fuel cell / battery hybrid power systems will be shown.

11:00 Methods and Tools for Designing Successful Hybrid Systems

Roger A. Dougal, PhD, Professor of Electrical Engineering, VTB Project Director, University of South Carolina

Design of fuel cell and battery hybrid systems entails integration of strongly interdisciplinary sub-systems involving everything from electrochemistry and power electronics to fluid and heat transfer. The design process can be simplified by the application of appropriate multidisciplinary design tools. This presentation will describe methods for hybrid system design and illustrate those methods with example systems that have been validated in hardware.

11:30 Networking Refreshment Break

12:00 Direct Borohydride Fuel Cells: A Novel Class of Fuel Cell - Battery Hybrid Technology

Gennadi Finkelshtain, Chief Technical Officer, Medis Technologies

Medis Technologies' Direct Borohydride Fuel Cells (DBFC) offers a compelling alternative to the traditional fuel cell chemistries. Medis has launched its first consumer product, the Medis 24/7 Power Pack, based on a novel approach, including proprietary chemistry and assembly technologies. We will provide an overview Power Pack product, including performance, production technology and chemistry. Medis has developed a second generation hybridized version of our Power Pack and we will provide an overview of our hybridization method, including an overview of the performance benefits created by hybridization.

12:30 Identification and Characterization of Near-Term Commercial Markets for PEM Fuel Cells in Portable Applications

Kathleen Judd, Senior Research Scientist, Pacific Northwest National Laboratory / Battelle Memorial Institute

In a study for the U.S. Department of Energy, TV broadcasting video cameras were identified as a near-term opportunity for portable direct hydrogen PEM fuel cells. A technical comparison of PEM fuel cells and competing battery alternatives was performed for TV broadcasting video cameras. The comparison includes a lifecycle cost analysis of fuel cell and battery technologies (lithium ion and nickel cadmium) under different use scenarios for TV broadcasting video cameras. A sensitivity analysis was also performed to show the variability in average annual system cost as individual factors (e.g. cost, durability of the fuel cell) are varied while other factors are held constant. A value proposition was defined for this market based on the overall market, economic, and technology assessments.

1:00 Lunch

2:15 Durability and Design of Battery / Fuel Cell Hybrid Systems

Tom Fuller, PhD, Professor, Director, Center for Innovative Fuel Cell and Battery Technologies, Georgia Institute of Technology

Hybrid architectures are becoming common regardless of the system scale. The principal goal of system design has been minimizing fuel consumption. Whereas it is understood that the components of the system must be evaluated and the control strategy scrutinized simultaneously, what's missing is any consideration of the durability of the electrochemical devices. The necessity of understanding and predicting not just initial performance but life behavior is paramount to commercialization of these power systems. A system model elucidates the interactions between components and enables the response of the system as a whole to changing load demands to be determined. Their life and the associated failure mechanisms are strongly dependent on the architecture, load profile, and control strategies. This is illustrated with an example of platinum stability in a fuel-cell hybrid system.

2:45 Development of a Fully-Integrated, Hybrid, High Temperature PEM Fuel Cell / Lithium Ion Battery Power Plant

Daniel A. Betts, PhD, Engineering Manager, EnerFuel, a subsidiary of Ener1, Inc.

From a business standpoint, Ener1, Inc. is well-positioned to take advantage of the upcoming demand for fuel cell/battery automotive power plants. Ener1 is the parent company of EnerDel, an automotive lithium-ion battery developer, and EnerFuel, a fuel cell company. While EnerDel is in the process of establishing itself as an important player in the automotive lithium ion battery market, EnerFuel has been developing fuel cells with substantial technical advantages over traditional automotive fuel cell technologies. EnerFuel has pioneered high temperature PEM fuel cell stacks. High temperature operation has allowed EnerFuel to pursue designs that are durable, thermally stable, compact, and relatively inexpensive. In this presentation, quantifiable benefits of EnerFuel's high temperature PEM fuel cell are discussed.

3:15 Networking Refreshment Break

3:45 Powering Micro-Systems with Fuel-Cell Hybrids

Gabriel A. Rincón-Mora, PhD, Professor of Electrical and Computer Engineering, Georgia Institute of Technology

The demand for portable, lightweight, long-lasting electronics is high, filling a growing need in military, space exploration, biomedical and commercial micro-sensors. Conforming to micro-scale dimensions means energy and power supplies, conditioning and processing microelectronics, sensors, wireless transceivers, and other constituent system components must synergistically share a common miniaturized platform. Integrating and managing micro-sources, however, present a myriad of diverse and interdependent mechanical, chemical, and electrical challenges. This talk presents hybrid energy-management schemes for powering micro-systems with emphasis on fuel-cell hybrids.

4:15 Fuel Cell and Battery Hybrid System for Portable Electronics Applications

Naehyuck Chang, PhD, Associate Professor, Dept of Electrical Engineering and Computer Science, Seoul National University, Korea

This talk introduces a PEM fuel cell and Li-ion battery hybrid system for use in portable microelectronic systems which are subject to high power fluctuation though their average power consumption is small. We introduce several issues in fuel cell and battery hybrid systems for such systems in view of computer engineering that includes architectures of hybrid systems, battery management, load shaping using power management techniques, and a prototype implementation.

4:45 PANEL DISCUSSION Fuel Cells / Batteries / Hybrid Power Systems: Different Problems - Common Solutions

Moderator - Tom Fuller, Georgia Institute of Technology

5:30 Concluding Remarks, End of Symposium

CONFERENCE AGENDA

Main Conference

Thursday, May 1, 2008

8:00 Registration, Exhibit Viewing/Poster Setup, Coffee & Pastries

8:35 Organizer's Opening Remarks

APPLICATION DRIVEN FUEL CELL DEVELOPMENT

8:45 Department of Energy Polymer Electrolyte Membrane (PEM) Fuel Cell R&D Activities

Terry Payne, PhD, PE, Technology Development Manager, Hydrogen, Fuel Cell & Infrastructure Technologies Program, The U.S. Department of Energy

Though the DOE Hydrogen Program emphasizes polymer electrolyte membrane (PEM) fuel cells in passenger vehicles, the program also supports fuel cells for portable power applications where earlier market entry would assist in the development of a fuel cell manufacturing base. This talk will provide an update on the status of DOE PEM fuel cell development particularly for portable power, ongoing efforts to eliminate barriers, and the path being pursued.

9:15 Portable Warfighter Power Technology

H. Scott Coombe, PhD, PE, Chief, Power Technology Branch, Army Power Division, Research, Development, & Engineering Command (RDECOM), U.S. Army

The US Army CERDEC is actively pursuing transition opportunity for Solider Portable Fuel Cells. For the past several years, CERDEC has worked comprehensive development programs to mature fuel cell technology to a level where field demonstration and transition opportunities are possible. This presentation will share information on the demonstration programs to date as well as information on military applications for mature fuel cell technology.

9:45 Reformed-Methanol PEMFC Systems: Advancing Toward Commercialization

Dave Edlund, PhD, Vice President, PEM & Reformer System Development, Protonex Technology Corporation

Liquid fuels are attractive for portable and remote fuel cell applications due to their ease and convenience of handling. Protonex has been aggressively developing a family of portable PEMFC systems, rated at 250 W_e, that incorporate a compact methanol / water reformer and integral hydrogen purifier. Both military and commercial applications are targeted. This paper will discuss the technical design and system specifications as well as testing that has been conducted to achieve acceptable levels of durability and ruggedness.

10:15 Direct Ethanol Fuel Cells: An Emerging Technology with Reduced Logistic Footprint for Military and Civil Applications

Michael Krausa, PhD, Fraunhofer Institute for Chemical Technology ICT, Germany*

Fuel cells could become a valuable tool to increase the running time of military devices or civil appliances. However, fuel logistics must be ready to introduce this technology. As we will show, ethanol offers in this regard a number of advantages compared to both hydrogen and methanol. Further on, we will show some recent developments, in particular in electro-catalysis, which should make this technology feasible in the near future. *In collaboration with: Carsten Cremers

10:45 Refreshment Break, Exhibit/Poster Viewing

DMFC FOR MOBILE ELECTRONICS — FROM TECHNOLOGY THROUGH APPLICATION TOWARD MANUFACTURING INFRASTRUCTURE

11:15 Micro Fuel Cell System for Mobile Consumer Electronic Devices

Shuji Goto, and Tadashi Senoo, Manager, Materials Laboratory, Sony Corporation, Japan

We are developing micro fuel cell systems for mobile consumer electronic devices. The system consists of series-connected direct methanol fuel cells, a fuel pump, a fuel cartridge, a Li-ion polymer battery and a power management circuit. We have achieved high power output, high energy efficiency and overall system size reduction by the combination of material development, power management algorithm development and component downsizing.

11:45 Mobile DMFC: Enhancement of Stack and System Stability

Inseob Song, PhD, Principal Manager-Fuel Cell Project, Samsung SDI Co, Ltd, Samsung, Korea*

Recent advancements on mobile DMFC system will be presented. Stack and system stability regarding the commercial aspects of Note PC application will be mainly concerned. Unique structure of fuel flow field and sealing component of 15W stack showed thermal stability in the range of user application. System design of 120Wh DMFC system having robust fuel management and system loop for continuous 10 hr operation will be discussed. And the author would like to share the characteristics of power performance of system showing that this technology moves one step forward to commercialization. *In collaboration with: K.Choi, H.Cho, and H.Chang, Samsung Advanced Institute of Technology, Korea

12:15 Creating a Global Fuel Cartridge Manufacturing and Distribution Infrastructure

Carl Kukkonen, PhD, CEO, Direct Methanol Fuel Cell Corporation, a VIASPACE Company

No one will buy a fuel cell powered notebook computer or cell phone unless fuel cartridges are readily available. Similarly no company will bring out fuel cartridges unless fuel cell powered products are in the marketplace. Obviously the products must be coordinated. The presentation will address progress in developing and meeting safety standards, and obtaining regulatory approval to carry fuel cells and cartridges on airplanes. Cartridge standardization is another issue - will the industry develop similarly to printers where each printer has a separate cartridge design, or will it be more like disposable batteries with a few standard sizes. Global manufacturing and

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distribution issues will also be discussed, including economics, national preferences and language issues, and branding. It is important to remember that the portable electronics OEM is selling the fuel cell powered device, however the consumer that buys the notebook computer is the person that buys cartridges in the aftermarket.

12:45 Luncheon Sponsored by
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SOFC

2:00 ONEBAT: Micro-Solid Oxide Fuel Cells for Battery Replacement in Portable Electronics

Anja Bieberle-Hütter, PhD, Institute for Nonmetallic Inorganic Materials, Department of Materials, ETH Zurich, Switzerland*

In the Swiss ONEBAT project micro-Solid Oxide Fuel Cells (μ-SOFCs) for replacement of batteries in portable electronics are fabricated. These are miniaturized solid oxide fuel cells in which the active fuel cell components - anode, electrolyte and cathode - exist as thin films forming a free-standing membrane on a substrate. The total thickness of the fuel cell membrane is less than 1 μm in thickness and of 200 μm in diameter. First fuel cell membranes delivered more than 150 mW/cm^2 at 550°C, and gave by their obtained theoretical open circuit voltage of 1.06 V the proof-of-concept for the technology. These ONEBAT μ-SOFCs are integrated in a larger system with reformer, post-combuster and insulation, and will later operate on propane buthane fuel mixtures from gas-lighters. *In collaboration with: D.Beckel, H.Galinski, U.P.Mücke, R.Tölke, T.Ryll, B.Scherrer, and L.J.Gauckler

2:30 Adaptive Materials and Portable SOFCs: Military Applications

Aaron Crumm, PhD, President, Adaptive Materials Inc.

Adaptive Materials has been aggressively developing micro-tubular solid oxide fell cell technology for military applications over the last seven years. Often overlooked at the lower power levels, Solid Oxide Fuel Cell (SOFC) technology offers a key advantage for use in portable applications; commercially available hydrocarbon fuels. AMI systems operate at energy densities in excess of 1200 wh/kg, with the potential opportunity to exceed 1500 Wh/kg. These metrics far exceed current battery technologies and offer a significant weight reduction for individual soldiers and critical equipment. This presentation will outline AMI's system development efforts and military field trial results.

PEM / HYDROGEN — FROM TECHNOLOGY TO APPLICATION

3:00 Methodology for Robust Design of Small Fuel Cell Systems: Application to Unmanned Aerial Vehicles

Tom Fuller, PhD, Professor, Director of the Center for Innovative Fuel Cell and Battery Technologies, Georgia Institute of Technology*

Aircraft and fuel-cell systems are strongly coupled in UAVs. A methodology is developed for modeling, design, and control of fuel-cell systems that is computer-based, application-integrated, parametric, and optimizeable. By embedding the design structure matrix into an optimization scheme, the optimizer can better identify configurations, design rules, families of high performance fuel-cell aircraft. Demonstration flight data and characterization of a fuel cell powered aircraft are presented. In addition, sample experimental results from HiL testing of the powertrain of a long endurance fuel cell powered UAV are presented with discussion. *In collaboration with: T.Bradley, Mech. Engineering/GaTech

3:30 Refreshment Break, Exhibit/Poster Viewing

4:00 Fabrication of 3D Micro Fuel Cells for Cell Phones

Allison M. Fisher, PhD, Principal Staff Scientist, Motorola Labs - Energy Technologies Lab, Motorola*

Cell phones are a particularly challenging application for fuel-cell based power systems because of volume limitations. A fuel cell/battery hybrid power source of the same volume as a current cell phone battery (10 cm^3-2.5 Wh) requires a smaller battery and a fuel cell with high power density and efficiency in order to achieve an overall energy density higher than that of the battery alone. Traditional planar fuel cell system approaches are not expected to be able to meet these requirements. Motorola is developing an alternative fuel cell design based on a three dimensional membrane electrode assembly. The high aspect ratio of this design provides a high surface area for hydrogen oxidation/oxygen reduction, and is fabricated using semiconductor processing methods combined with self-assembly and other wet chemical methods. In this design, thousands of 3D micron-sized fuel cells can be fabricated in a 1 cm^2 footprint. This presentation will describe our progress toward the fabrication and testing of these unique fuel cells. *In collaboration with: R.C. Koripella, R.Krishnan, K.Eisenbeiser, J.Hallmark, and J.Jaskie

4:30 Development of Micro-Fuel Cells Using Carbon Monoliths

Hanna Rajantie, PhD, Research Scientist, Johnson Matthey, United Kingdom*

We have developed a micro fuel cell for portable applications using carbon monoliths to replace flow-fields and gas diffusion layers on the anode side. An air-breathing prototype hydrogen fuel cell has been constructed and performance proven. Using methanol as a fuel, the monolith porosity can be tuned to allow high concentrations of methanol to be used. For different power requirements different cell configurations, including bipolar, monopolar and variants of these, are preferred to optimise the volumetric power density. *In collaboration with: J.Sharman, D.Thompsett, Johnson Matthey Plc; D.Brown, MAST Carbon Technology Ltd, UK; B.Sowerby, et al, C2 Chandler Consulting, UK

5:00 From Concept to Product - Development and Scale-Up Production Implementation for myFC's FuelCellSticker™ Technology

Björn Westerholm, CEO, and Anders Lundblad, PhD, CTO, myFC AB, Sweden

Fundamentals for industrialization in micro fuel cells: What

CONFERENCE AGENDA

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needs to be accomplished to be able to start the commercialization wave? The FuelCellSticker™ has proven to be an outstanding technology in terms of performance, conformability and cost. Today, its performance has reached 600 mW/cm³ with a lifetime of over 2000 h. Design conformability is demonstrated through a radius smaller than 6 mm. Cost target can be reached via cheap and effective production technology. Interest from market is created via myFC's FuelCellPlatform development, as exemplified in designed chargers that are suitable for mass production. Proof of concept demonstration projects are currently realized through industrial collaboration projects. The talk will discuss technological advances versus market demands and how they are met in the development and industrialization process that myFC is currently pursuing.

5:30 Selected Oral Poster Highlights

5:45 Concluding Discussion, End of Day One

Friday, May 2, 2008

8:15 Exhibit/Poster Viewing, Coffee and Pastries

DMFC — PERFORMANCE, APPLICATION, COMMERCIALIZATION

9:00 Technological Advancement vs. Platinum Cost Optimization Paradigm for DMFC

Detlef Stolten, Professor, Dr-Ing, Director, Institute of Energy Research / Fuel Cells, IEF3, Jülich Forschungszentrum, Germany*

DMFC system originally developed for a class 2 lift truck is used as a prototype for stack and system design optimization and for outlining the cost analysis for small-to-medium size DMFCs. The DMFC system has been proven to work for 500 hours under dynamic operation. It was completely fitted into the battery trough including all of the peripheral components, electronics and control. Future full costs for operation have been evaluated and compared with a hydrogen fuel cell solution and the conventional lead acid battery system. Using a DMFC for this application turned out to be viable for the easy handling of the liquid methanol over hydrogen and the investment and labor intense re-charging process of batteries. The drawback of comparably high platinum investment with DMFC stacks is resolved by a stack rental model. Though, cost of the system over life-time, interest considered, is affordable if not attractive, the higher investment for platinum in the first place may be considered an obstacle by customers. A side-by-side multi-parameter analysis of the stack and systems design vs. performance and cost will be presented. *In collaboration with: J.Werhahn, J.Mergel

9:30 Passively Operated Vapor-Fed Direct Methanol Fuel Cells for Portable Applications

Christopher Hebling, PhD, Head of Department Energy Technology, Fraunhofer Institute for Solar Energy Systems ISE, Germany*

The impact of structural parameters and operating conditions has not been researched yet for vapor-fed operation of a DMFC at near-ambient conditions. Thus, a detailed parameter study that included reference cell measurements to assess anode and cathode losses separately was performed. Among other parameters like temperature or air stoichiometry, different opening ratios that controlled evaporation of methanol into the vapor chamber were examined. Water management was found to be a critical parameter for a vapor-fed DMFC. Depletion of water inside the anode catalyst layer, especially at higher current densities, decreased performance of the fuel cell substantially. Back diffusion of water from the cathode to the anode was examined. A micro-structured cathode electrode that increased water back diffusion due to a reduced mass transfer resistance was developed and investigated. *In collaboration with: S.Eccarius, F.Krause, T.Manurung, C.Agert, Fraunhofer ISE; K.Beard, U. South Carolina

10:00 The Crucial Step: From Prototypes to Commercial Product

Jens Müller, PhD, CTO, SFC Smart Fuel Cell AG, Germany*

The step from prototypes and field trials to real products is still a major challenge. Only very few fuel cell players have managed to show real market traction so far. This presentation will discuss the success factors which enabled SFC to sell more than 7,000 fuel cell systems to date - on a truly commercial basis. The presentation will feature SFC's product portfolio including the company's latest portable fuel cell systems, as well as several of the industrial applications in which SFC fuel cells are used worldwide. *In collaboration with: P.Podesser, C.Boehm

10:30 Refreshment Break, Exhibit/Poster Viewing

DMFC — THE MATERIALS AND COMPONENTS CHALLENGE

11:00 Advances in Hydrocarbon Membrane Development

Philip Cox, PhD,Vice President of Product Development, PolyFuel Inc.

PolyFuel's current generation of hydrocarbon fuel cell membranes exhibit methanol crossover levels that are 1/2 to 1/3 of those of competing fluorocarbon membranes. PolyFuel's membranes are being incorporated into a rapidly increasing share of DMFC systems that have been demonstrated by the leading portable fuel cell system developers. While pleased with this accomplishment, PolyFuel recognizes that there is still room for continued improvement, and with the support of funding from the Advanced Technology (ATP) Program within the National Institute for Standards and Technology (NIST), PolyFuel has embarked on a 24 month program to reduce the level of fuel crossover by a further 75% from PolyFuel's current low levels, without negatively impacting the electrochemical performance of the fuel cell itself. PolyFuel will provide an update on the progress toward the development of this next generation hydrocarbon membrane for portable DMFC applications.

11:30 Low Cost Membrane and Catalyst Development for Portable Fuel Cells

Arumugam Manthiram, PhD, Professor, Electrochemical Energy Laboratory & Materials Science and Engineering Program, The University of Texas at Austin

Direct methanol fuel cells are appealing to replace lithium ion batteries in portable devices, but their commercialization is

CONFERENCE AGENDA

Main Conference (cont.)

hampered by high cost, durability, and operability problems, which are in turn linked to severe materials challenges. This presentation will focus on the development of novel low cost polymeric membranes that exhibit suppressed methanol crossover as well as low cost nanoalloy catalysts for oxygen reduction reaction that exhibit high tolerance to methanol.

12:00 Advanced DMFC Electrocatalyst for Portable Applications

Hanwei Lei, PhD, DMFC Project Leader, Cabot Fuel Cells, Cabot Corp.

Cabot has developed a new electrocatalyst platform based on spray conversion. Superior carbon supported catalysts have been developed to address the commercialization barriers for DMFC portable applications. Cabot PtRu/C catalysts have unique aggregate morphology with small crystalline size, high degree of alloy and high dispersion of the active phase, which results in MEA's higher power, better durability and lower costs. Recent technological advancements in Cabot DMFC catalyst and MEA development and implementation will be discussed.

12:30 Lunch on Your Own

PEM / HYDROGEN — ADVANCES IN TECHNOLOGY AND APPLICATION

2:00 Military Fuel Cells for Tactical Power Generation and Battery Charging

Eric Simpkins, Vice President, IdaTech, LLC

IdaTech has developed two small fuel cell systems for commercial, defense and civil applications. A fully integrated 250 Watt portable fuel cell power plant has applications as a battery charger or stand-alone power plant. This system is commercially available, and will be hardened for defense applications. A fully integrated 3 kW fuel cell system has been developed for the Army, that is fueled with flightline jet and diesel fuels.

2:30 Remote Surveillance System Powered by PEM Fuel Cell

Vesna Stanic, PhD, Senior Research Scientist, EnerFuel, Inc

EnerFuel has developed a Remote Surveillance System (RSS) that is able to send images wirelessly through the existing cellular network. The RSS can operate independently from months to a year depending on the frequency of image generation and sending. A hybrid power system that includes a battery, solar cell and PEM fuel cell system, provides the power for the RSS's independent operation. However, the key elements for the reliable and long run time are PEM fuel cell and hydrogen system. At the presentation the performance data of the RSS, and more specifically PEM fuel cell and hydrogen system, will be presented and discussed in details.

3:00 Molecular Relaxations and Morphology of Perfluorosulfonate Ionomers for Fuel Cell Applications

Kirt A. Page, PhD, Polymers Division, National Institute of Standards and Technology

Perfluorosulfonate ionomers (PFSI's) are of great importance in polymer electrolyte membrane fuel cell (PEMFC) applications. In order to optimize membrane performance, it is essential to understand the development of morphology and the structure-property relationships in these materials. Since the influence of the electrostatic interactions in these ion-containing polymers governs the developing structure, the overall goal of these studies has aimed to expand our fundamental understanding of the influence of electrostatic interactions on chain dynamics and developing morphology in PFSI materials.

3:30 Refreshment Break, Exhibit/Poster Viewing

4:00 Development of Direct Hydrogen Micro Fuel Cell Technology

Sukhvinder P.S. Badwal, PhD, Chief Research Scientist, CSIRO Energy Technology; and Oreion Energy Australia Pty Ltd., Australia*

Direct hydrogen fuel cell (DHFC) technology is under development for a range of applications with power demand in the 1 to 200W range at Oreion Australia Energy (in collaboration with CSIRO). In this presentation the benefits of DHFC over direct methanol fuel cells, applications, the developmental program, micro fabrication technologies used for large volume manufacturing and performance of micro-fabricated components and stacks will be discussed. *In collaboration with: S.Giddey, B.A.Sexton, F.L.Glenn, F.T.Ciacchi, R.E.Clarke, and D.Fini

4:30 Rechargeable, Low-Pressure, High-Density Hydrogen Storage for Portable Fuel Cells

Michael Zelinsky, Director, Hydrogen Systems, Ovonic Hydrogen Systems LLC

No single hydrogen storage solution is likely to solve the needs of all fuel cell applications as each technology has its own unique combination of advantages and disadvantages. This presentation will contrast various hydrogen storage methods, focusing on reversible metal hydrides. We will investigate how the technology works and examples of commercial fuel cell applications where it has been successfully deployed.

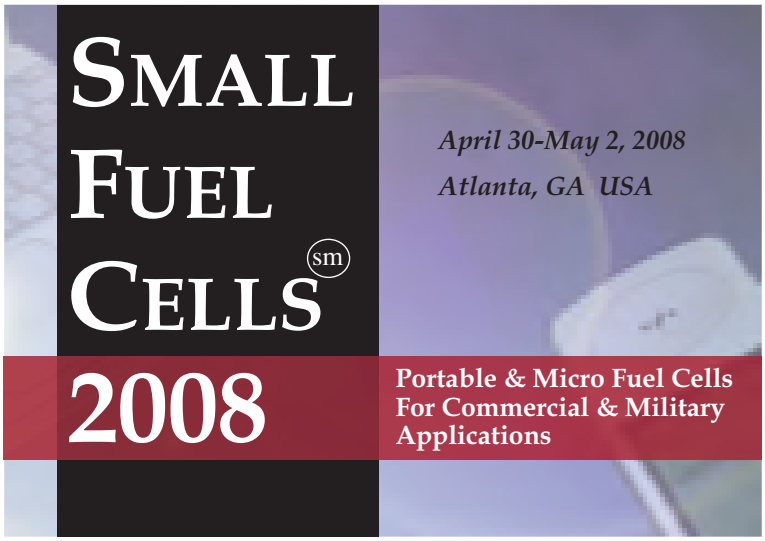
5:00 A Microfluidic Fuel Cell with Flow-Through Porous Electrodes

Erik Kjeang, PhD, Institute for Integrated Energy Systems (IESVic), University of Victoria, Canada

A membraneless microfluidic fuel cell architecture incorporating flow-through porous electrodes is demonstrated. The proposed architecture solves the transport limitation of previous laminar flow-based microfluidic fuel cells. Improved performance is exhibited, including power densities up to 131 mW/cm^2 at room temperature. The flow-through cell architecture concurrently enables high levels of fuel utilization and cell voltage, reaching an overall energy conversion efficiency of 60% per single pass, and facilitates in situ regeneration of fuel and oxidant.

5:30 Concluding Discussion, End of Conference

Brochure images courtesy of Atomic Energy Commission - DTEN France



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E-Mail: custserv@knowledgefoundation.com

PAYMENT: All payments must be made in U.S. funds drawn on a U.S. bank. Please make check(s) payable to The Knowledge Foundation, Inc. and attach to the registration form even if you have registered by phone, fax or e-mail. To guarantee your registration, payment must be received prior to the conference. Confirmation of your booking will follow.

DISCOUNT ACCOMMODATIONS AND TRAVEL: A block of rooms has been allocated at a special reduced rate. Please make your reservations by **March 28, 2008**. When making reservations, please refer to the The Knowledge Foundation if you require assistance.

Venue: Omni Hotel at CNN Center
100 CNN Center
Atlanta, GA 30303

For Hotel Reservations Contact:

ANDERSEN TRAVEL
Phone: **(508) 429-6494 or 1-800-229-6494**
Fax: **(508) 429-7380**
Email: **kramer@andersentvl.com**

SUBSTITUTIONS/CANCELLATIONS: A substitute member of your company may replace your attendance at any time at no charge if you find your schedule prevents you from attending. Please notify us immediately so that materials can be prepared. If you do not wish to substitute your registration, we regret that your cancellation will be subject to a $100 processing fee. To receive a prompt refund, we must receive your cancellation in writing 30 days prior to the conference. Unfortunately cancellations cannot be accepted after that date. In the event that The Knowledge Foundation, Inc. cancels an event, The Knowledge Foundation, Inc. cannot resume responsibility for any travel-related costs.

UNABLE TO ATTEND?
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