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## **FUEL CELL CONNECTION - April 2007 Issue**

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News on U.S. Government Fuel Cell Programs
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*1. Argonne Engineering Breakthrough to Aid PEMFC Catalyst Production*

Researchers at Argonne National Laboratory (ANL) have developed an advanced concept in nanoscale catalyst engineering that can open up new directions for the development of active and stable cathode catalysts in fuel cells. The researchers have identified a cathode surface capable of potentially exceeding the target for catalytic activity, while improving stability. ANL plans to continue research combining nanoscale fabrication, electrochemical characterization and numerical simulation for a new generation of multi-metallic systems with engineered nanoscale surfaces. [http://www.anl.gov/Media\\_Center/News/2007/MSD070302.html](http://www.anl.gov/Media_Center/News/2007/MSD070302.html)

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*2. LBNL, ANL Researchers Identify New Alloy for Fuel Cell Catalyst*

Researchers with the Lawrence Berkeley National Laboratory (LBNL) and Argonne National Laboratory have identified a new variation of a platinum-nickel alloy that would greatly increase the oxygen-reduction activity on PEM fuel cell cathodes. The new alloy configuration, Pt 3 Ni(111) displayed activity 10 times better than a single crystal surface of pure platinum(111) and 90 times better than platinum-carbon. [http://www.ornl.gov/info/news/pulse/pulse\\_v232\\_07.htm](http://www.ornl.gov/info/news/pulse/pulse_v232_07.htm)

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*3. SECA Project Meets DOE Performance, Durability and Cost Targets*

A planar SOFC system built by Versa Power and FuelCell Energy under contract to DOE's Solid State Energy Conversion Alliance (SECA) has met all DOE-specified performance and durability targets. Factory cost calculations exceeded DOE's goal. The project will move ahead on a separate DOE program aimed at developing a large-scale SOFC power plant capable of running on clean coal. [http://www.corporate-ir.net/ireye/ir\\_site.zhtml?ticker=FCEL&script=410&item\\_id=989377&layout=23](http://www.corporate-ir.net/ireye/ir_site.zhtml?ticker=FCEL&script=410&item_id=989377&layout=23)

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*4. SRNL Program to Study Hydrogen Storage Material Safety*

Savannah River National Laboratory (SRNL) will lead a four-year international program to study the safety of new materials being considered for hydrogen storage. The program, "Fundamental Safety Testing and Analysis of Hydrogen Storage Materials & Systems," was formally recognized and endorsed by the Steering Committee of the International Partnership for the Hydrogen Economy. [http://www.ornl.gov/info/news/pulse/pulse\\_v232\\_07.htm](http://www.ornl.gov/info/news/pulse/pulse_v232_07.htm)

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*5. Students Build and Race Model Fuel Cell Cars at DOE National Science Bowl*

More than 300 high school students participated in DOE's National Science Bowl®, which gave participants the opportunity to build and race a model fuel cell car. Teams of students from Edwin O. Smith High School in Connecticut and Bridgeport High School in West Virginia won first place in the Hydrogen Fuel Cell Model Car Challenge's two events. The event was also sponsored by General Motors, which introduced hydrogen fuel cell vehicles and other advanced technologies to the participants. [http://www.scied.science.doe.gov/nsb/pdf/Hydrogen\\_Winner.pdf](http://www.scied.science.doe.gov/nsb/pdf/Hydrogen_Winner.pdf)

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RFP/Solicitation News
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*6. USDA Offers Energy Efficiency and Renewable Energy Loans & Grants*

The U.S. Department of Agriculture (USDA) announced the availability of \$176.5 million in loan guarantees and \$11.4 million in grants to support investments in renewable energy and energy efficiency improvements by agricultural producers and rural small businesses. The loan guarantees cover up to 50 percent of a project's cost, up to \$10 million. Grants are for up to 25 percent of a project's cost: up to \$250,000 for energy efficiency improvements and up to \$500,000 for renewable energy systems. Applications are due by May 18, 2007.

<http://www.usda.gov/wps/portal/usdahome?contentidonly=true&contentid=2007/03/0070.xml>

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#### *7. ATP R&D Competition Announced*

The U.S. Department of Commerce's Advanced Technology Program (ATP) announced a new competition to support R&D projects that accelerate the development of high-risk technologies. Approximately \$60 million is expected to be available, with individual projects receiving up to \$2 million for multi-year R&D activities. Technology areas include "Challenges in Advanced Materials and Devices" and "21<sup>st</sup> Century Manufacturing." Project proposals are due May 21, 2007.

<http://www.atp.nist.gov/atp/apply.htm>

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#### *8. DOD SBIR Solicitation Includes Fuel Cell Topics*

The U.S. Department of Defense has released its 2007 Small Business Innovation Research (SBIR) Solicitation, which includes several fuel cell-related topics. Potential proposers may talk directly with Topic Authors until May 13, 2007, to ask technical questions about the topics. Phase I awards under the solicitation will be \$70,000 to \$100,000 in size over a period of six to nine months. Deadline for proposals is June 13, 2007.

<http://www.acq.osd.mil/osbp/sbir/solicitations/sbir072/index.htm>

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#### *9. Pennsylvania Offers \$31.4 Million in Alternative Energy Grants*

Pennsylvania's Department of Environmental Protection is offering \$31.4 million in grants to finance clean energy projects in the state. Eligible technologies include fuel cells, landfill gas, and solar energy. Grants will be targeted to fund projects that promote and build markets for advanced or renewable energy technologies. A free workshop for potential applicants will be held May 3, 2007, in Williamsport, PA. Deadline for grant applications is June 15, 2007.

<http://www.depweb.state.pa.us/news/cwp/view.asp?Q=520796&A=3>

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### **Contract / Funding Awards**

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#### *10. DOE Selects Six Projects to Receive \$8.2 Million for Hydrogen Storage Research*

The Department of Energy has selected six projects to receive a total of up to \$8.2 million over four years for hydrogen storage research and materials safety research in support of the president's Advanced Energy Initiative. Argonne National Laboratory, Miami University, Sandia National Laboratories, United Technologies Research Center and University of Hawaii are the organizations selected to lead the projects. <http://www.energy.gov/news/4944.htm>

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#### *11. Air Force Awards Contract for Fuel Cell Medical Power Source*

The U.S. Air Force awarded a contract to Millennium Cell and Jadoo Power for a 300-Watt power system to provide 12 hours of runtime for use as a power supply for aeromedical evacuation flights. The program aims to demonstrate a fuel cell system capable of powering an Air Force Patient Support Pallet by the end of 2007.

<http://millenniumcell.com/fw/main/default.asp?DocID=92&reqid=979352>

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State Activities
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*12. New Mexico Increases State's Renewable Portfolio Standard*

New Mexico Governor Bill Richardson signed into law a bill that increases the state's Renewable Portfolio Standard. The original legislation required at least 10 percent of an electric utility's power supply to come from renewable sources (including fuel cells using non-fossil fuel) by 2011. The new Standard requires at least 15 percent by 2015 and 20 percent by 2020.

<http://legis.state.nm.us/lcs/session.asp?chamber=S&type=++&number=418&year=07>

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*13. Arkansas Expands Net-Metering Policy*

Arkansas has enacted legislation to expand the state's net-metering policy beginning January 1, 2008. The new law increases the maximum capacity of a commercial net-metered system from 100 kW to 300 kW and extends the availability of net metering to all other nonresidential customers with systems up to 300 kW in capacity. Additionally, the law allows net-metered customers to carry over net excess generation to the following monthly bill at the utility's retail rate. Residential net-metered systems remain limited to 25 kW.

<http://www.arkleg.state.ar.us/ftpoot/bills/2007/public/HB2334.pdf>

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*14. PEDA Grant Results in Partnership to Manufacture Fuel Cell Products in High Volume*

A grant from the Pennsylvania Energy Development Authority (PEDA) in 2006 has led to the formation of a Center of Excellence for Advanced Energy Systems Manufacturing by Kuchera Defense Systems. The company has formed a strategic relationship with Millennium Cell focused on the commercialization and high-volume production of Hydrogen on Demand® fuel cartridges and PowerSkin™ fuel cells for military and industrial applications that require up to 5 Watts of power. <http://www.millenniumcell.com/fw/main/default.asp?DocID=92&reqid=986662>

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Industry Headlines
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*15. Fuel Cell Demonstrator Airplane Prepared for Testing*

Boeing announced plans to conduct experimental flight tests this year of a manned propeller-driven airplane powered only by a fuel cell and lightweight batteries. The flight test will be conducted as part of the Fuel Cell Demonstrator Airplane research project. Systems integration testing is now under way in preparation for the upcoming ground and flight tests.

[http://www.boeing.com/news/releases/2007/q1/070327e\\_nr.html](http://www.boeing.com/news/releases/2007/q1/070327e_nr.html)

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*16. Voller Fuel Cell Set for Installation on Sailing Yacht*

Voller Energy announced the first installation of the company's 1-kW fuel cell generator will be on the company's Beneteau Oceanis 411 sailing yacht. The fuel cell system can be fitted to the existing wiring of the boat – fitting into an aft locker normally used for a conventional generator – and will use the propane that is already on board the boat for cooking.

<http://production.investis.com/vlr/rns/rnsitem?id=1174899461nRNSZ6803T>

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*17. GM Unveils 5<sup>th</sup> Generation Fuel Cell at Shanghai Auto Show*

General Motors unveiled a fifth-generation automotive fuel cell that is half the size of its predecessor. The fuel cell, which was integrated into the Chevrolet Volt concept vehicle, delivers a range of 300 miles on a tank of only 4 kilograms of hydrogen. The fuel cell concept car was shown at Auto Shanghai 2007.

<http://www.media.gm.com/servlet/GatewayServlet?target=http://image.emerald.gm.com/gmnews/viewmonthlyreleasedetail.do?domain=828&docid=35402>

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#### *18. ReliOn Fuel Cells Complete UL Certification*

ReliOn announced its T-1000® and T-2000® fuel cell systems have completed certification for Underwriters Laboratories' ANSI/CSA FC 1-2004 standard for Stationary Fuel Cell Power Systems. <http://www.relion-inc.com/news.asp#22>

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University Activities

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#### *19. University Fuel Cell Roundup*

(summaries contributed by Kathy Haq, Dir. of Outreach and Communications, National Fuel Cell Research Center, UC Irvine, [khaq@nfcrc.uci.edu](mailto:khaq@nfcrc.uci.edu))

In February, California State University Northridge dedicated its new 1-MW fuel cell power plant — the single largest fuel cell power plant at any university in the world. The plant generates baseload electricity for the university's facilities and surplus heat for buildings, showers, hot water used in food service, and the swimming pool at the Student Union. Tom Brown, executive director of Northridge's Physical Plant Management, said that incorporating the fuel cell plant into campus operations will reduce the university's carbon dioxide emissions into the environment by 60 million pounds during the lifetime of the plant. The Direct FuelCell® power plant was purchased from FuelCell Energy, Inc. Southern California Gas Company committed up to \$2.25 million in incentive funding to support the installation, and the Los Angeles Department of Water and Power committed an additional \$500,000. [5-Feb-2007, *Cal State Northridge*]

Scientists at the University of California, Riverside and Pacific Fuel Cell Corp. have shown for the first time in a recent publication (*J. Power Sources*, 2006, 158:154-159) that carbon nanotubes can have more than 40 percent longer life than carbon black under simulated cathode operating conditions. The same UCR group has also demonstrated previously that carbon nanotube-based catalysts can double the platinum utilization, potentially leading to a significant cost reduction for fuel cell production. [13-Feb-2007, *Distributed via M2 Communications Ltd.*]

Kettering University has hired Peter Scott as the new director of its Fuel Cell and Advanced Technology Incubator. His assignment is to help inventors and entrepreneurs commercialize new technologies and businesses. Scott earned dual bachelor's degrees in mechanical engineering and aerospace engineering from the University of Michigan, Ann Arbor, in 1987. For the next five years, he designed aircraft engines for General Electric. He added a master's of science degree in aerospace engineering from the University of Cincinnati in 1992 and an M.B.A. from the University of Michigan in 1994. Aiding Scott in this new endeavor will be one of Kettering's newest corporate partners, the Michigan Small Business & Technology Development Center (MI-SBTDC). It will soon begin offering regional services to small businesses in Genesee and Lapeer counties from the fifth floor of the Campus Center. The MI-SBTDC regional office will be staffed with an intake administrator, regional director and traditional business consultant. [9-Mar-2007, *Kettering University News*]

A team of University of Vermont scientists led by electrical engineering professor Walter Varhue is delving into the realm of nanotechnology in hopes of developing a new material that will utilize

sunlight to split water into hydrogen and oxygen. A single particle of sunlight contains enough energy to split water, but the conversion process isn't efficient, Varhue said. New materials brought by nanotechnology could solve this problem. "If the current efficiency of 6 percent can be increased to 10 percent, you could have farms across the country making hydrogen instead of growing corn." Much of the work has focused on a material called titanium oxide, Varhue said. But so far, that material has been shown only to make use of about 6 percent of the energy in sunlight in the hydrogen-making process. The plan is to "grow" crystals from four elements: gallium, zinc, nitrogen and oxygen, in carefully controlled amounts. Those elements naturally join to form the crystals, which the scientists call "nanostructured catalysts for the photoelectrochemical production of hydrogen." [11-Mar-2007, *The Associated Press State & Local Wire*]

A new institute dedicated to interdisciplinary research on energy at the University of Michigan will lead to more partnerships between the university and the automobile industry, university professors say. Renovations are about to begin on a building on that used to contain the university's nuclear reactor to create a hub for the Michigan Memorial Phoenix Energy Institute. Scheduled to open in 2008, the renovated lab building, called the Michigan Memorial Phoenix Laboratory, will provide shared space and resources for faculty who are interested in research into a variety of energy fields — including advanced nuclear power systems, batteries, hydrogen and solar technologies, and fuel cells. The energy institute is being created as other universities across the country are also devoting more resources to energy research. Gary Was, director of the institute, said the variety of expertise that will be tapped on campus will set U-M's effort apart. "We feel that the energy issue goes beyond a solely technological answer," said Was, who cited questions of economics, public policy, regulation and consumer attitudes that need to be addressed. [18-Mar-2007, *Ann Arbor News* (Michigan)]

Researchers at Saint Louis University in Missouri have developed a fuel cell battery that runs on virtually any sugar source — from soft drinks to tree sap — and has the potential to operate three to four times longer on a single charge than conventional lithium ion batteries, they say. For consumers, that could mean significantly longer time to talk and play music between charges. The new battery, which is also biodegradable, could eventually replace lithium ion batteries in many portable electronic applications, including computers, the scientists say. Their findings were described at the 233rd national meeting of the American Chemical Society. "This study shows that renewable fuels can be directly employed in batteries at room temperature to lead to more energy-efficient battery technology than metal-based approaches," says study leader Shelley Minteer, an electrochemist at the university. "It demonstrates that by bridging biology and chemistry, we can build a better battery that's also cleaner for the environment." Funding for this study was provided by the U.S. Department of Defense. [29-Mar-2007, *Space Daily*]

Kettering University is pursuing a \$2.7 million fuel cell research laboratory to be built on land across from its campus and anchor a research park. [1-Apr-2007, *Flint Journal* (Michigan)]

An Oxford University research team led by Fraser Armstrong has built a "biofuel cell" that produces electricity from ordinary air spiked with small amounts of hydrogen. The technology, described at the 233<sup>rd</sup> national meeting of the American Chemical Society, offers an inexpensive and renewable alternative to platinum-based fuel cells. The biofuel cell was built with hydrogenases, enzymes from naturally occurring bacteria that use or oxidize hydrogen in their metabolism. The cell consists of two electrodes coated with the enzymes placed inside a container of ordinary air with 3 percent added hydrogen. Prototype versions of the cell produced enough electricity to power a wristwatch and other electronic devices. Armstrong foresees advanced versions of the device as potential power sources for an array of other electronic products that only require low amounts of power. [2-Apr-2007, *Space Daily*]

The University of Delaware recently began operating a shuttle bus powered by hydrogen fuel cells. The bus was unveiled during an April 9 ceremony on the university's Newark campus. The hydrogen fuel cell bus project is supported by a \$1.7 million grant from the U.S. Department of

Transportation's Federal Transit Administration, matched by private financing from companies working in partnership with the University. [9-Apr-2007, *UD News*]

Scientists at Iowa State University and Ames Laboratory are investigating new materials that may someday be used as economical substitutes for palladium. Success in this area would significantly reduce costs associated with the production of hydrogen for fuel cell vehicles. "The substitute material must allow hydrogen to diffuse through it rapidly, must be ductile enough to allow the material to be fabricated into long, thin tubes and it must resist corrosion while operating in an oxidizing environment at 400 to 500 degrees Celsius," said Alan Russell, a scientist at Ames Laboratory and professor of materials science and engineering at Iowa State. "Nearly 100 alloys have been made so far and tested for ductility and the ability to diffuse H," Russell said. Robert Buxbaum, lead scientist for the project and president of REB Research & Consulting, a Michigan company specializing in hydrogen generators, illustrated their results thus far with this Thomas Edison quote, "I have not failed. I've just found 10,000 ways that won't work. ... We've found a bunch of things that are almost there," Buxbaum said, "But even the things we missed at, a lot of it's awfully cool." [10-Apr-2007, *Iowa State Daily* via U-WIRE]

Allison Engstrom, a materials science and engineering junior at Arizona State University, is one of two ASU students selected to receive a Goldwater Scholarship. Eric Anderson, a bioengineering sophomore, was honored as well. The \$7,500 scholarship, which is the nation's highest award for undergraduates planning careers in scientific research, is given on academic merit, as well as the extent and sophistication of the student's undergraduate research. Engstrom, who plans on pursuing a doctorate in materials science and engineering, worked with engineering professor Cody Friesen on promising nanotechnology to improve the efficiency of fuel cells. [10-Apr-2007, *US States News*]

A University of New Hampshire student team that designed a microbial fuel cell took first-place honors and the Intel Innovation Award in the 17<sup>th</sup> Annual International Environmental Design Contest. Engineering and business students working together as MicroCellutions Inc. designed a single-chamber, open-air microbial fuel cell that successfully converts cow manure directly into electricity. The team won first place under "Task 4: Conversion of Biomass Resource to Useful Forms of Energy and Other Products." This year's design challenges revolved around water, its viability and availability, and renewable energy resources. The annual contest is sponsored by the Waste Management Education and Research Consortium, which includes universities and national laboratories in New Mexico. Competitors tackle real-life problems provided by industry and government. [17-Apr-2007, *UNH Media Relations*]

Ford Australia is working with the University of Melbourne on a long-term research project to study efficient and practical hydrogen-fueled vehicle technologies. Aided by a \$1.2 million grant from the Victorian Government, the program will begin in July and Ford will contribute engines and resources to the project to help with engine and vehicle development. The project will also investigate hydrogen generation and storage technology. Ford boss Tom Gorman says the project is the first to research hydrogen engine alternatives using an Australian-sourced engine. The project team's first priority is to develop, build and test a hydrogen-fueled turbo-charged Ford six-cylinder engine using an advanced combustion technology known as hydrogen-assisted jet ignition. [13-Apr-2007, distributed by *Financial Times Information* and published in the *Canberra Times*]

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Administration
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Press releases and story ideas may be forwarded to Bernadette Geyer, editor, for consideration at [fuelcellconnection @ yahoo.com](mailto:fuelcellconnection@yahoo.com).



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*US Fuel Cell Council* -- The US Fuel Cell Council is the business association for anyone seeking to foster the commercialization of fuel cells in the United States. Our membership includes producers of all types of fuel cells, as well as major suppliers and customers. The Council is member driven, with eight active Working Groups focusing on: Codes & Standards; Transportation; Power Generation; Portable Power; Stack Materials and Components; Sustainability; Government Affairs; and Education & Marketing. The Council provides its members with an opportunity to develop policies and directions for the fuel cell industry, and also gives every member the chance to benefit from one-on-one interaction with colleagues and opinion leaders important to the industry. Members also have access to exclusive data, studies, reports and analyses prepared by the Council, and access to the "Members Only" section of its web site. (<http://www.usfcc.com/>)

*National Fuel Cell Research Center* -- The mission of the NFCRC is to promote and support the genesis of a fuel cell industry by providing technological leadership within a vigorous program of research, development and demonstration. By serving as a locus for academic talent of the highest caliber and a non-profit site for the objective evaluation and improvement of industrial products, NFCRC's goal is to become a focal point for advancing fuel cell technology. By supporting industrial research and development, creating partnerships with State and Federal agencies, including the U.S. Department of Energy (DOE) and California Energy Commission (CEC), and overcoming key technical obstacles to fuel cell utilization, the NFCRC can become an invaluable technological incubator for the fuel cell industry. (<http://www.nfcrc.uci.edu/>)

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