

FLC NE REGION NEWSLETTER – SUMMER 2010

Message from the Regional Coordinator – Lewis Meixler

Welcome to the summer 2010 issue of our newsletter. In this issue you will find updates on what's taking place in our laboratories. The types of activities at our labs in recent months, including educational outreach, research to improve our skies and rails, and enhancing the nutrition of crops, represent not only the diversity of missions, but also the common goal of impacting our lives in a positive way.

I want to thank those who came out and attended our regional meeting at the 2010 FLC national meeting in Albuquerque. It was great to see you and get your inputs on what can be done to strengthen the profiles of our laboratories—not just in the FLC, but in the technology transfer world at large. Another highlight of the national meeting was the presentation of three of this year's FLC awards to winners from the Northeast Region. I want to congratulate the Army Armament Research, Development and Engineering Center and the Army Natick Soldier Research, Development and Engineering Center for receiving Awards for Excellence in Technology Transfer, and Dr. Theresa Baus of the Naval Undersea Warfare Center Division Newport for winning the 2010 Harold Metcalf Award. Their hard work and dedication to fulfilling the mission of their laboratories' technology transfer efforts are indeed worthy of recognition.

Speaking of awards, the nomination period for the 2010 Northeast regional awards is open until July 9. Keep in mind that the selected winners will also be eligible for consideration in the national 2011 awards. In recent years the Northeast Region has experienced an upward trend in receiving awards, so help us keep the momentum going by submitting a nomination or two.

Finally, our fall 2010 meeting will take place September 20-22 in West Point, New York, which was also the site of our spring meeting. Hotel information and a meeting agenda will be posted on our website shortly, so be sure to check for updates.

Thanks for reading and have a great summer!

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Brookhaven Lab Chemists Receive Patents for Fuel-Cell Catalysts

Chemists at Brookhaven National Laboratory received three patents for developing catalysts to accelerate chemical reactions in fuel cells. The newly patented catalysts, as well as a method for making a particular type of catalyst with a thin layer of platinum, could greatly reduce the cost and increase the use of fuel cells in electric vehicles. The catalysts and the technique are available for licensing.

Platinum is the most efficient catalyst for fuel cells. However, the platinum-based catalysts are expensive, unstable, and have low durability. The newly patented catalysts have high activity and stability, while containing much less platinum than the amount used in current fuel cells, so their cost is reduced.

“Fuel cells are expected to become a major source of clean energy that can impact both transportation and stationary power sectors,” said Radoslav Adzic, the principal researcher for all three patents. “They have several advantages for automotive applications and can be used extensively in electric cars if the technology can be made to work efficiently and economically. Developing these electrocatalysts is a big step in that direction.”

Several types of renewable fuel—such as hydrogen, ethanol or methanol—may be used in fuel cells. A hydrogen fuel cell, for example, converts hydrogen and oxygen into water and, in the process, produces electricity. Hydrogen is oxidized by separating into negatively charged electrons and positively charged ions with the help of a catalyst at the fuel cell’s negative pole, the anode. Electrons then travel to the positive pole, the cathode, creating electricity with their movement. At the cathode, with the aid of a catalyst, oxygen gains electrons, resulting in oxygen reduction, and combines with hydrogen ions forming water, the only byproduct of a hydrogen/oxygen fuel cell.

Two of the Brookhaven chemists’ patents were awarded for catalysts that speed up oxygen reduction. One is composed of a thin layer of platinum on palladium nanoparticles, which is more efficient than current catalysts. The other includes metal oxides, such as niobium oxide and ruthenium oxide, with a thin layer of platinum. The patent also covers a unique method for depositing a thin layer of platinum on the metal-oxide catalysts.

Compared to the patented platinum-palladium catalyst, the metal oxides combined with platinum are more stable and cost-effective, although the catalytic efficiency is not as high. Thus, the patented catalysts are complementary and can be tailored for various applications.

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The scientists also received a patent for adding gold clusters to platinum-based catalysts. In the reactions during the stop-and-go driving of an electric car, platinum dissolves, which reduces its efficiency as a catalyst. But the researchers have overcome this problem by adding a very small amount of gold to the platinum-based catalyst. With the addition of gold, the platinum was kept intact during an accelerated stability test, which mimicked the stop-and-go conditions of an electric car. The gold clusters protected the platinum from being oxidized, which stabilized the platinum, making possible improved platinum-based catalysts.

U.S. patent no. 7,691,780 B2 for the development of platinum-palladium catalysts was issued to Brookhaven's Adzic and Miomir Branko Vukmirovic, along with Junliang Zhang and Yibo Mo, formerly of Brookhaven. Adzic, Vukmirovic and Kotaro Sasaki of Brookhaven received title to U.S. patent no. 7,704,918 for metal oxide-platinum catalysts and their unique method of making them. Adzic and Zhang received U.S. patent no. 7,704,919 for adding gold clusters to platinum-based electrocatalysts. The Department of Energy's Office of Science and its Office of Energy Efficiency and Renewable Energy funded the research that led to these patented technologies. For information about licensing them, contact Kimberley Elcess at 631 344-4151 or elcess@bnl.gov.

2010 FLC Northeast Region Awards – Call for Nominations

The Northeast Region is now accepting nominations for its 2010 awards. The deadline to submit nominations is Friday, July 9, 2010, and the awards will be presented in September 2010 at the Northeast regional meeting in West Point, New York. Nomination packages are now available online at <http://www.flcnortheast.org/awards.html> in MS Word and PDF formats.

Awards will be presented in the following categories.

Regional Coordinator's Excellence Award

Presented to the FLC Laboratory Representative or Alternate in recognition of the individual's significant contribution to the FLC program during the past year. The individual selected for this award will be the Northeast Region's nominee for the national FLC's Representative of the Year Award.

Regional Laboratory Award

Presented to the federal laboratory within the Region in recognition of extraordinary efforts, which exceed legislated requirements, in the furtherance of national and regional technology transfer activities.

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Regional Appreciation Award

Presented to any individual who is not a direct employee of a government-owned and operated (GOGO) or a government-owned, contractor-operated (GOCO) organization who has made a significant contribution to the federal technology transfer program. The act, effort, or support must have been for the primary purpose of promoting and/or extending technology transfer from the federal laboratory system to nonfederal entities. The individual selected for this award will be the Northeast Region's nominee for the national FLC's Outstanding Service Award.

Industry/Non-Federal Government/University Award

This award is presented to an American-owned company, nonfederal government entity, or university within each FLC region that has made outstanding efforts to promote either the actual transfer of federal technology transfer or the federal technology transfer program during the 12 months preceding the nomination.

Excellence in Technology Transfer Award

Presented to laboratory employee(s) who have accomplished outstanding work in the process of transferring federally developed technology to the marketplace. The winners of this award will be nominated for the national FLC's Award for Excellence in Technology Transfer.

FAA William J. Hughes Technical Center Signs Agreement to Research Unmanned Aircraft Systems in the National Airspace System

The Federal Aviation Administration's (FAA) William J. Hughes Technical Center has established a Cooperative Research and Development Agreement with Insitu, Inc., of Bingen, Washington, and the New Jersey Air National Guard to study unmanned aircraft systems (UAS) and to address their integration into the national airspace system (NAS). Insitu, a wholly owned, independent subsidiary of The Boeing Company, will provide the FAA with two ScanEagle aircraft and their related support hardware and data. The FAA will conduct research to guide development of recommendations for integrating UAS into the NAS. The research will be managed by the FAA's Research and Technology Development Office and conducted at the Technical Center.

The two-year agreement will enable FAA scientists to study and better understand UAS design, construction and functionality. Also, researchers will look at the differences in how an air traffic controller would manage an unmanned aircraft vs. a manned aircraft by integrating the ScanEagle system into Technical Center air traffic control simulations and studies.

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Insitu will train FAA pilots and support staff to fly and maintain the system, and will supply documentation related to the ScanEagle system. Flight testing will take place over the New Jersey Air National Guard's Warren Grove Range, 20 miles north of the Technical Center.

UAS now fly within the NAS under certificates of authorization, or FAA waivers. The waiver process is issued for public entities and determined on a case-by-case basis, with most UAS operations segregated from other air traffic. More than 1,500 types of UAS are in production worldwide, so it is important to establish the parameters to enable them to operate within the NAS safely and efficiently.

UAS are cleared to fly in restricted airspace, including the military airspace at Warren Grove Range, owned and operated by the New Jersey Air National Guard. The ScanEagle has flown more than 315,000 hours in military operations, providing intelligence, surveillance and reconnaissance. It can fly more than 24 hours at a time, and has been used in many civil applications, including search and rescue operations, fire and flood monitoring, and evacuation efforts conducted in hazardous weather.

New State-of-the-Art Locomotive Simulator Installed at Volpe

The Federal Railroad Administration (FRA) recently installed the Cab Technology Integration Laboratory (CTIL), a state-of-the-art locomotive simulator, at the Volpe Center in Cambridge, Massachusetts. It will allow researchers to simulate a number of conditions and scenarios encountered during railroad operations to identify safety problems and develop effective solutions. The \$1.6 million CTIL was constructed by Alion Science and Technology. Among its capabilities, the full-sized locomotive simulator can accurately record crew behavior through the video, audio, and eye-tracking capabilities at the control and button-pushing level. This allows researchers to carefully observe the actions of train crews and monitor the corresponding effect of their actions on the simulated locomotive they are operating. Other features include modeling and visualization technologies, which are tools to optimize the physical design and configuration of locomotive cabs to enhance crew performance.

The Volpe Center provides human factors services to support safe and productive railroad operations, including: assessment of railroad system performance; investigation of human performance in accidents in railroad operations; and identification of methods for reducing accidents and improving working conditions for the FRA.

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Brookhaven Launches Program to Bring Big Science to Classrooms

A new program at Brookhaven National Laboratory will give high school teachers and their students access to multimillion-dollar instruments at one of the nation's premier scientific facilities. In its first year, the program—Introducing Synchrotrons into the Classroom (InSynC)—is expected to engage dozens of teachers and students in hands-on experiments at Brookhaven's National Synchrotron Light Source (NSLS). The NSLS produces intense x-ray, ultraviolet, and infrared light to study everything from advanced materials for solar cells and computer components to complex proteins from living cells.

“We often hear teachers say that students learn best in a laboratory,” said NSLS biophysicist and InSynC co-founder Lisa Miller. “But some of the most interesting experiments require equipment that's too expensive to provide in a high school laboratory. InSynC is a way to bring some of this big science into the classroom.”

Starting this summer, interested high school science teachers will participate in an intensive, three-day InSynC workshop at Brookhaven to learn about the NSLS, a facility that every year attracts about 2,200 visiting scientists from around the world to take advantage of its unique and powerful instruments. The session also will introduce teachers to experimental techniques available at the NSLS, and show them how to write a proposal to use the facility. At the beginning of the school year, these teachers will work with their students to develop a synchrotron experiment. Possible subject areas include energy, environmental sciences, geosciences, plant biology, biomedicine, structural biology, and robotics. Their proposals will be reviewed by a panel of scientists and teachers, and the groups with the highest scores will bring their experiments to life.

From the comfort of their classrooms, students will discuss projects with NSLS scientists, share data, and conduct their experiment via Internet-enabled tools.

“InSynC is an effort to help teachers and students understand the way science really gets done,” said University of Chicago geoscientist and InSynC co-founder Tony Lanzirotti. “That involves formulating a hypothesis-driven scientific problem, writing a competitive proposal to investigate it, and lots of collaboration.”

The NSLS has a long history of advancing science education. Hundreds of students already have participated via webcasts in unique projects at the facility—ranging from the analysis of sediment, mussels, and oysters in local waterways to studying soil samples surrounding backyard decks built with chemically treated wood.

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“For the past several years, we have worked with teachers and NSLS scientists to bring authentic research into the classroom,” said Scott Bronson of Brookhaven’s Office of Educational Programs. “InSynC is the culmination of these efforts. The launch of InSynC also will help sustain investments in teachers made by the Academies Creating Teacher Scientists (DOE-ACTS) program of DOE’s Office of Science, which aims to enhance teachers’ understanding of science and technology by connecting them with national laboratory scientists.”

Initially, InSynC will be aimed at regional high schools, but the organizers say it has the potential to become a nationwide competition, involving the participation of all U.S. synchrotron facilities. “Every student deserves the chance to be an NSLS scientist for a day,” Lanzirrotti said.

The Office of Workforce Development for Teachers and Students (WDTS) within the DOE Office of Science is providing support for InSynC. “The Office of Science National User Facilities, such as the NSLS, are home to some of the most exciting and innovative science being done in the world,” said WDTS Director Bill Valdez. “Exposing high school teachers and students to these unique resources will increase their knowledge of modern science and will help disseminate this knowledge to other students and teachers. If this pilot program is successful, BNL’s InSynC program could be the leading edge of a movement in DOE to make all of the DOE National User Facilities available to students and teachers across the country.”

Better Beans Mean Better Health for All

Beans that add pleasing tastes and textures to chili, soups, and other favorite dishes may tomorrow be an even better source of an essential nutrient—iron. That’s a goal of Agricultural Research Service (ARS) physiologist Raymond P. Glahn. His studies may help plant breeders develop new and improved beans.

Glahn, based at the ARS Robert W. Holley Center for Agriculture and Health on the Cornell University campus at Ithaca, N.Y., collaborates in the research with Elad Tako, an ARS research associate; Michael A. Rutzke, a Cornell University analytical chemist; and others. Their research would especially benefit the more than two billion people worldwide who are iron-deficient.

Some of the Ithaca investigations are designed to determine how plant breeders and others might boost beans’ iron bioavailability—the amount of iron that the body can absorb and use from beans. To discover more about the availability of iron in beans, or in other foods and food components, in 1998 Glahn developed a laboratory test that uses Caco-2 (pronounced KAY coe) human intestinal cells. The test gives an indication of how the human digestive system would treat beans and nutrients from beans.

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Lab animal tests, conducted as a followup to some Caco-2 assays, are an important intermediate step between Caco-2 tests and costly studies with human volunteers, according to Glahn. In recent years, tests conducted by Glahn and co-researchers at Ithaca suggest that chickens have promise as an animal model for iron-absorption studies.

In an article published earlier this year in *Poultry Science*, Glahn and co-investigators report that chickens are sensitive to iron deficiency and that at least a half-dozen different indicators of this deficiency, already used in studies with other animals, are valid for research with chickens as well. In other work, Glahn's team found that results from their iron bioavailability tests with chickens confirmed a Caco-2 finding: iron in red beans was less bioavailable to the animals than iron in white beans.