Sandia's Navid Jam

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DOE Pulse

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SRNL project to explore sub-nano technology

A new research project could lead to fuel cells with significantly lower cost and improved performance. DOE's Savannah River National Laboratory is studying whether the use of highly dispersed platinum as a fuel cell electrode catalyst could reduce the amount of platinum used. Fuel cells use platinum, an expensive precious metal, as a catalyst to facilitate the reaction of hydrogen and oxygen. Mathematical modeling and experience with petrochemical industry catalysts indicate that the amount of precious metal could potentially be reduced by a factor of 100, if the platinum catalyst were dispersed so that every platinum atom is active for catalytic reaction, rather than being stacked against each other. The SRNL project, led by Steve Xiao, will examine catalyst structure at the sub-nanometer and even the single-atom level to determine whether dispersing the platinum will allow a significant reduction in the amount used in a fuel cell.

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Role of spin in building nucleus

A scientist who studies spin and its role in the force that builds the nucleus of the atom has been awarded the 2009 JSA Postdoctoral Research Fellowship at DOE's Jefferson Lab. Patricia Solvignon holds a postdoctoral appointment at Argonne National Lab. The lead author on a recent publication involving neutron spin, Solvignon is now continuing a similar line of research. The grant she was awarded will go toward purchasing a piece of equipment needed for the next experiment—a stainless steel vacuum glove box for handling a rare isotope of calcium that oxidizes when exposed to oxygen.

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Researchers probe iron superconductor puzzle

Scientists at DOE's Argonne National Laboratory used inelastic neutron scattering to show that superconductivity in a new family of iron arsenide superconductors cannot be explained by conventional theories. Argonne physicists Ray Osborn and Stephan Rosenkranz led an international collaboration to perform neutron experiments using samples of the new compounds, and discovered a magnetic excitation in the superconducting state that can only exist if the energy gap changes sign from one electron orbital to another. Inelastic neutron scattering continues to be an important tool in identifying unconventional superconductivity, not only in the iron arsenides, but also in new families of superconductors that may be discovered in the future.

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Second target station for the SNS

DOE has given its initial approval to begin plans for a second target station for the Spallation Neutron Source, expanding what is already the world's most powerful pulsed neutron scattering facility located at DOE's Oak Ridge National Laboratory. The Critical Decision Zero (CD-0) status is the first step in an approximately $1 billion construction project. The second target station will be optimized for nanoscale and biological sciences with an emphasis on novel materials for energy production, storage and use. The new target station—the most intense source of its kind in the world—will generate long pulses of "cold" neutrons, which are cryogenically chilled to wavelengths that are more useful for molecular-scale analysis.

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DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***DOE Pulse*** (www.ornl.gov/news/pulse/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

Basic research for energy security: A call to action

The United States faces a grand challenge: finding alternatives to fossil fuels and improving energy efficiency to meet our growing energy needs over the next century and beyond. Scientists from DOE's Brookhaven, Los Alamos, Argonne and Oak Ridge National Laboratories, among others, are working to advance renewable, sustainable sources of energy such as solar, wind, hydro, and biofuels/biomass, and seeking innovations in producing, converting, transmitting, storing, and using energy. Together with researchers from the University of California, MIT and the Center for Study of Science, Technology and Policy, they'll present their collaborative approach as a "Call to Action" at the annual meeting of the American Association for the Advancement of Science (AAAS), Friday, February 13, 2009, 8:30 to 11:30 a.m. Central Time at the Hyatt Regency Chicago, Grand F.

According to many leading scientists, basic research — particularly in the emerging field of nanoscience — will enable advances in catalysis, superconductivity, artificial photosynthesis, and other important areas of energy research. Solar energy utilization, superconductivity, electrical energy storage, and energy conversion using nanoscale materials are therefore among the major research thrusts at DOE labs.

Advances in nanoscience and nanotechnology throughout the DOE complex are enabling dramatic improvements in our ability to find cost-effective uses for solar energy through three primary approaches to solar energy utilization —solar electricity, solar fuel, and solar thermal technologies. Nanoscience and nanotech advances are addressing bottlenecks and hurdles in all these approaches.

A coalition of scientists from DOE labs and collaborating institutions has planned a concerted effort to develop artificial nanoscale materials that could be used to store the energy of sunlight in a transportable fuel. Planned activities include the development of nanoscale photovoltaics, new electrochemical systems, and molecular and nanoparticle catalysts.

Submitted by DOE's Brookhaven National Laboratory

Sandian Navid Jam champions need for videoconferencing security

In 2004 Sandia National Laboratories initiated an investigation into potential security vulnerabilities in common off-the-shelf videoconferencing systems after a Sandia technologist discovered a security problem with videoconferencing software. Project leaders enlisted the help of college interns in Sandia's Center for Cyber Defenders.

Navid Jam

Navid Jam was one of those interns. Jam and the team performed a variety of attacks to demonstrate vulnerabilities. The objective was to develop best practices and tools to help users.

Mitigating the risks proved to be fairly simple. The bigger challenge was educating people about the need for security with videoconferencing devices.

"People . . . should understand that a videoconferencing device operates much like a PC and as such requires protection such as a firewall program," says Jam.

Jam, who was hired by Sandia in 2005, began giving talks at DOE, DoD, and public Internet security conferences. He talked to anyone interested in learning about the risks of embedded collaboration systems.

"He really stood out and took the lead to advertise these types of vulnerabilities," said Sandia technologist Corbin Stewart, who originally discovered the videoconferencing vulnerability.

A breakthrough came in 2006 when Jam met with the National Security Agency Red Team and shared the issues and solutions Sandia had identified.

"They really championed our cause and helped us gain fairly high visibility throughout the government," says Jam. The small, internal project grew into a larger program with funding from government agencies and videoconferencing systems vendors.

Last fall, Jam was chosen as one of three finalists for NSA's 2008 Frank B. Rowlett Award, which recognizes excellence in information systems security. The award typically stays within the armed services; Jam was the only nonuniformed individual nominee.

Jam says it's been rewarding to see the impact of his work on a broad spectrum of customers. "I think this shows recognition of the important role national laboratories play in information assurance and cyber security for the nation."

Submitted by DOE's Sandia National Laboratories