NREL's John Rugh

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DOE Pulse

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Living with carbon nanotubes

Scientists with DOE''s Lawrence Berkeley National Laboratory (Berkeley Lab), led by Carolyn Bertozzi and Alex Zettl, working with graduate student Xing Chen and others, have developed a means of making toxic carbon nanotubes (CNTs) biocompatible. By coating the CNTs with a synthetic polymer that mimics mucin, the substance on cell surfaces that serves as a lubricant, Bertozzi, Zettl, Chen and their collaborators have been able to safely attach them to biological cells. The coating can also be customized to bind to a specific type of cell. This technology should open the door for the application of CNTs to biological systems.

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NETL testing second SECA Phase I Prototype Fuel Cell

Researchers from the Advanced Fuel Cell Group, Office of Research and Development, at DOE's National Energy Technology Laboratory, have begun verification testing of the second SECA Phase I Solid Oxide Fuel Cell prototype delivered to NETL. The unit, developed by FuelCell Energy and Versa Power Systems, was started up in July using pipeline natural gas fuel. The unit exports power to the grid to support NETL onsite power needs, and thus far has been operated at a peak power of 3 kW. Researchers expect to operate the unit at a fixed power output for 1500 hours to acquire performance and degradation data.

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LLNL sends science teachers to summer school

LLNL's Science Technology and Education Program partnered with the University of California Davis School of Education's Edward Teller Education Center to create the Teacher Research Academy, now in its fourth year. Middle and high school science teachers learn about the Lab's cutting-edge scientific research while using advanced scientific instrumentation with classroom activities. The expectation is that teachers will use what they learn to motivate students in pursuing science careers. There are three academies: Fusion-Astrophysics, Biotechnology and Biophotonics, with a fourth in energy technologies and environment in development. This summer, more than 130 teachers participated. For information see the Web at http://education.llnl.gov

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Building better models of the Universe

Scientists at DOE's Los Alamos National Laboratory have developed a new method for incorporating astronomical data into computer simulations. The method promises to be a significant advance in enabling future cosmological surveys aimed at understanding dark energy and dark matter. Dark matter and dark energy are theoretical forms of matter and energy thought to permeate the Universe, with dark energy believed to produce a large-scale force that works against gravity. By combining what are often very large and expensive computer simulations with data from observational instruments, such as optical and radio telescopes, scientists are able to calibrate the computer simulations and create better predictive models of the universe.

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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).

LLNL joins nuclear criticality training effort

DOE's Lawrence Livermore Lab now offers DOE national lab workers a unique nuclear criticality training course that until recently was only available at Los Alamos National Laboratory (LANL).

Criticality safety is an essential element in the training of National Nuclear Security Administration (NNSA) workers who handle or otherwise deal with special nuclear materials (SNM). However, in recent years, facility closures at other NNSA sites resulted in the elimination of the "hands-on" portions of the training. This negatively affected the quality of criticality safety training in the NNSA complex and was identified as such by the Defense Nuclear Facilities Safety Board.

So, last March, NNSA turned to Lawrence Livermore. In four months the nuclear criticality training curriculum was developed and approved, along with all the necessary facility modifications and safety considerations.

Barbara Krögfuss of Y-12 participates in a nuclear criticality training exercise with LLNL certified fissile material handler Nolan Lomba (right) and Mark Lee of the DOE Livermore Site Office.

In August, the first group of lab workers to complete the course developed by Livermore staff received diplomas.

The initial class was comprised primarily of criticality safety professionals from LANL, Oak Ridge National Laboratory (ORNL) and Savannah River. Training modules included classroom sessions involving regulatory and safety issues, as well as several trips to LLNL's Superblock for hands-on experiments involving fissile materials, supervised by senior LLNL certified material handlers.

In addition, participants dealt with a criticality accident scenario. "We usually focus most of our attention on accident prevention. But we also need to keep in mind how to deal with the unexpected, if it were to happen," said Dave Heinrichs, LLNL Criticality Safety Section project co-leader and course instructor.

The Criticality Safety Section designed the technical content and experiments, and taught the courses. LLNL's R Division contributed neutron detection expertise and the detection devices. The Nuclear Materials Technology Program provided the technical and operational support needed to conduct the hands-on portion of the class.

Submitted by DOE's Lawrence Livermore National Laboratory

NREL's Rugh helps drivers use less gas

John Rugh

As task leader for DOE's National Renewable Energy Laboratory's Vehicle Ancillary Loads Reduction (VALR) project, John Rugh is helping to reduce fuel consumption and tailpipe emissions in light-duty vehicles while maintaining passenger comfort.

"Our overall goal is to develop and evaluate technologies that will reduce automobile air conditioning fuel use and the amount of imported crude oil," Rugh said.

Rugh is working with the automotive industry on ways to predict and reduce air conditioning loads. By incorporating such technologies as solar reflective glass and paint, it is possible to reduce thermal loads on the air conditioner, thereby reducing fuel consumption without compromising comfort.

"If a car's air conditioner is used less often or can be downsized, car owners could see savings at the pump," Rugh said.

Maintaining passenger comfort is a key requirement to the ancillary loads reduction effort and Rugh's team has developed several thermal comfort tools. One tool is the ADvanced Automotive Manikin (ADAM), a manikin controlled by a physiological model of the human body to respond to changes in the environment. This way of predicting human responses can be used in a variety of testing environments including automobiles, aircraft, military vehicles, flight suits and more.

Another promising path to reducing air conditioner loads is to use waste heat generated by engines. The VALR team is investigating a number of heat-generated cooling technologies, including thermoacoustics. The thermoacoustic technique uses waste heat to generate sound. The sound waves cycling through then drive a heat pump to cool the car.

Rugh joined NREL in 1998 as a member of the hybrid vehicle team working on such projects as vehicle thermal testing and prediction of human thermal comfort. Before coming to the Laboratory, he worked for 11 years at Lockheed Martin Astronautics on the Titan/Centaur Program. The jump from heat transfer research to vehicle research was easy for Rugh because of his desire to help reduce engine loads imposed by air conditioners.

Submitted by DOE's National Renewable Energy Laboratory