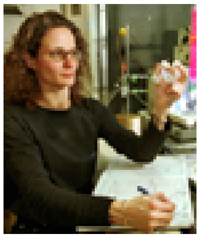

Sandia's Tina Nenoff examines vials of pollution-trapping powder. *Page 2*

DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

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Research Highlights . . .

Airborne data detects mercury trail

Researchers from DOE's National Energy Technology Laboratory have employed airborne electromagnetic conductivity surveys to determine the route that contaminated groundwater is suspected of taking from a flooded mine impoundment to California's Clear Lake. Previously, the Environmental Protection Agency had performed extensive ground-based hydrologic investigations that suggested the existence of a groundwater flow connection, but was unable to pinpoint the exact route that the ground water was taking. Airborne data, combined with higher resolution ground data, revealed an area of high conductivity that extends from the impoundment to Clear Lake, indicating the likely subsurface flow path.

[David Anna, 412/386-4646, anna@netl.doe.gov]

New device for disposal of chemical weapons

DOE's Sandia National Laboratories/ California has teamed with the US Army to successfully dispose of six sarin-filled bomblets found during Superfund cleanup at the old Rocky Mountain Arsenal in Colorado. Sandia scientists designed and built an Explosive Destruction System (EDS) that can be transported by trailer to sites where old WW I and WW II chemical munitions have been found buried. The EDS was field-tested at the United Kingdom's Defence Evaluation and Research Agency in Porton Down, England. The test involved destroying recovered munitions from past wars, primarily those containing phosgene gas or mustard. One test also included destruction of a bottle of sarin, in anticipation of the Colorado project.

[Nancy Garcia, 925/294-2932, negarci@sandia.gov]

Gene could explain obesity

The discovery of a fat gene in mice at DOE's Oak Ridge National Laboratory could lead to a better understanding of why some people have weight problems. Even though researchers had these particular mice on a low-fat diet since they were born, the mice are up to 50 percent fatter than their litter mates. Researchers found that the normal mouse has a gene on chromosome 7 that they believe plays a role in transporting fat into fat cells. Unlike some known mouse obesity genes that can act alone, ORNL researchers have shown that the chromosome 7 gene must act with other genes involved in maintaining the body's energy balance.

[Ron Walli, 865/576-0226; wallira@ornl.gov]

System helps prevent power grid failures

A system using technology from DOE's Pacific Northwest National Laboratory and the Bonneville Power Administration soon will provide key information to California power providers that are challenged by increased loads and decreased supply. The system, called WAMS for Wide Area Measurement System, continuously monitors grid performance across the Western power system. It provides operators with high-quality data and analysis tools to detect impending grid emergencies or to mitigate grid outages. WAMS data access and toolsets are being provided to California's Independent System Operator, which manages wholesale power delivery in that state. DOE and the Electric Power Research Institute supported WAMS' initial development.

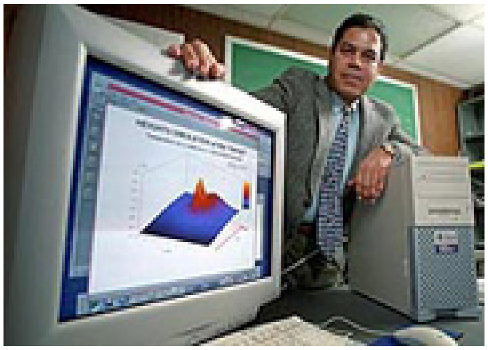
[Staci Maloof, 509/372-6313, staci.maloof@pnl.gov]

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).

Software reaches new HEIGHTS

The propose`d Rare Isotope Accelerator (RIA) at DOE's Argonne National Laboratory would produce an unprecedented variety of beams of short-lived isotopes, many at intensities more than 100,000 times those currently available. It would also produce lots of heat.

To handle the materials challenges, RIA designers are using the software package that is the international standard for simulating material behavior under intense energy exposure—an Argonne-created software system called HEIGHTS—to design the best beam target and cooling system.



Argonne's Ahmed Hassanein developed the HEIGHTS computer software system.

"We designed HEIGHTS to simulate the physics of intense energy and power deposition on targets," said Ahmed Hassanein, manager of the Computational Physics and Hydrodynamics Section in Argonne's Energy Technology Division. HEIGHTS, for High Energy Interaction with General Heterogeneous Target Systems, simulates phenomena like shock and ignition physics, heat and radiation propagation through the atmosphere and photon transport through different media.

HEIGHTS has been used extensively for modeling plasma-material interactions in laboratory devices and Tokamak fusion machines in Europe, Japan, Russia and the United States. The intense heat of plasma created in magnetic confinement fusion reactors—approximately 100 million degrees—challenges designers. HEIGHTS simulates the plasma's interaction with reactor materials and the subsequent vapor cloud to determine what materials can withstand the plasma and photon radiation and how long they will last in a fusion reactor.

High-energy physicists at Fermilab and Brookhaven National Laboratory use HEIGHTS to model the targets for an international muon collider and neutrino factory. The software is used to model high-velocity liquid-metal jets in strong magnetic fields. HEIGHTS is also used to study the shock hydrodynamic effects from proton beam bombardment that produces pions that decay into muons.

Submitted by DOE's Argonne National Laboratory

Molecular Traps Snare Problem Chemicals

Tina Nenoff

Researchers studying ways to capture radioactive chemicals swimming in a sea of hazardous waste have created a new class of molecular cages that, like lobster traps, let certain species in while keeping others out.

The team at DOE's Sandia National Laboratories was led by principal investigator Tina Nenoff.

The new microporous materials, named Sandia Octahedral Molecular Sieves (SOMS), could help purify industrial process or waste streams or filter out valuable chemicals for reuse.

They also show particular promise for helping clean up 53 million gallons of warm, radioactive muck inside 177 underground storage tanks at DOE's Hanford, Wash., site—the byproduct of 50 years of nuclear weapons production.

The new SOMS are extremely selective for strontium-90, one of the two most prevalent radioisotopes in the Hanford tanks. In lab tests the SOMS trapped 99.8 percent of strontium-90 ions in parts-per-million concentrations from solutions containing chemically similar and highly abundant sodium ions, says Tina.

Tina grew up in Washington Township, N.J. She earned her undergraduate degree in chemistry—with a minor in archaeology—at the University of Pennsylvania, and her master's and doctoral degrees in chemistry at the University of California-Santa Barbara. She joined the Sandia staff in November 1993.

The Sandia team is collaborating with researchers from the University of California-Davis, Pacific Northwest National Laboratory, the University of Michigan, the State University of New York-Stony Brook, and Lawrence Livermore National Laboratory.

Chemically, a SOMS is a tiny sponge that sucks up divalent cations (atom groups with a +2 charge) into its microscopic pores and snares them at negatively charged bonding sites that have been vacated by ions with weaker charges—a process called ion exchange.

Submitted by DOE's Sandia National Laboratories