Berkeley's black-clad Siminovitch is into light.

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Research Highlights . . .

Little detector performs with the big ones

Researchers at DOE's Oak Ridge National Laboratory have developed a point-and-shoot portable instrument capable of protecting both people and the environment. The battery-powered RAMiTS (for RAMan Tunable Integrated Sensor), which analyzes chemicals in just seconds, performs comparably to laboratory-scale instruments and is simple to operate. RAMiTS uses Raman technology, employing a helium neon laser, acousto-optic tunable filters and a photo sensor to detect toxic chemicals, TNT, byproducts from explosives, drugs and hundreds of chemicals in liquid or powder form. RAMiTS could be used to monitor environmental pollution, detect chemical agents, inspect food products or serve as a medical diagnostic tool.

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Environmentally friendly grout

A stream-sealing technique developed at DOE's National Energy Technology Laboratory is being tested in Naticoke Creek near Wilkes Barre, Pa., to prevent acid mine drainage. A 310-foot section will be injected with an environmentally benign grout, which expands to seal off subsurface fractures, preventing clean water from being contaminated by underwater mines. Terry Ackman, NETL mining engineer, says the grout eliminates the potential for environmental damage if spillage should occur, and will give, thus resisting cracking, should subsidence occur. NETL is monitoring the grout's performance and durability in a one-year project for the U.S. Army Corps of Engineers.

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New technology reduces noxious emissions

Unlike gasoline engines, there isn't an economically viable technology that can sufficiently reduce air pollution-causing nitrogen oxides in the exhaust typical of diesel vehicles. Research at DOE's Pacific Northwest National Laboratory promises to change that. PNNL researchers have successfully reduced harmful oxides of nitrogen on an operating diesel engine by half via the combination of an electrically charged gas, or plasma, with a specialized catalyst. Laboratory results show even greater reductions are possible. These reductions are critical to meeting emissions requirements and fuel economy goals in diesel vehicles. A class of zeolite catalyst materials appears to be the key to nitrogen oxide reduction in this novel approach to controlling harmful vehicle exhaust emissions

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Team to test self-contained fuel cell battery

The Center for Transportation Technologies and Systems battery thermal management team at DOE's National Renewable Energy Laboratory will soon begin testing a 14-volt nickel hydrogen battery from ElectraStor to measure its power and energy capabilities and operation in extreme temperatures. This unique battery stores hydrogen in a separate hydride compartment when the battery is not in use, allowing for negligible amounts of self-discharge. NREL will use its calorimeter to test the battery under various charge/discharge cycles, as well as during numerous driving cycles to help in the design of a battery thermal management system.

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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).

Collaborative project researches carbon allocation

Greenhouse gas carbon dioxide is converted into wood, roots and leaves by trees, so it would seem natural to turn to trees to pull carbon dioxide out of the atmosphere. But to efficiently use trees and plants to hold carbon and help reduce the threat of global warming, scientists must better understand how trees convert carbon dioxide into wood and root tissue.

NREL and ORNL researchers get to root of carbon issue.

DOE's National Renewable Energy Laboratory and Oak Ridge National Laboratory have partnered to research the underlying genes involved in this conversion.

The collaborative project, funded by NREL's Director's Discretionary Research and Development Program and ORNL's Laboratory Directed Research and Development Program, combines the genetics expertise of ORNL researchers and the biomass analysis expertise of NREL researchers. "We were able to use core capabilities from both Labs for one project," said NREL researcher Mark Davis.

Davis and Jerry Tuskan of ORNL's Biofuels Feedstock Development Program are working to determine the genetic basis for how carbon is allocated and partitioned into the cell walls of roots and stems of trees - a subject of utmost importance for carbon sequestration strategies and for thermochemical and biochemical conversion.

Over the past two years, Davis and Tuskan have been collecting samples of poplar trees to determine lignin, cellulose, and hemicellulose content in roots and stems. In addition, they have been collecting data on the amount of carbon located in the roots versus the part of the tree above ground.

"Our objective is to characterize a genetic basis for understanding the mechanisms which control the amount of carbon in the roots and stems of these plants," said Tuskan.

Tuskan and Davis believe this information will be of interest to academicians, the forestry and agricultural industries and programs funded by DOE because of the basic understanding of plant physiology the information offers.

Submitted by DOE's National Renewable Energy Laboratory

Optical efficiency and the human factor

Michael Siminovitch

Lighting accounts for a fourth of the nation's electricity consumption, yet it's one of the simplest ways to save. Better lamps can't do the job alone, however, as Michael Siminovitch of Berkeley Lab's Environmental Energy Technologies Division learned. "You have to make people happy. It's the most important thing in persuading them to change."

While studying architecture at the University of Illinois, Siminovitch says, "The more I learned about light, the more I realized what a difference it could make in cost and livability."

With a Ph.D. in architecture and human factors from the University of Michigan, he found a home in the lighting research program at Berkeley Lab. "I like playing with the apparatus," he admits, and his lighting lab is chock full of it: the Spectro-Radiometer, the Gonio-Photometer, the Integrating Sphere. . . .

Technical developments include new uses for compact fluorescent lamps (CFLs), better task lighting for the US Postal Service, and improved lighting for beverage machines. Equally important are friendly designs.

For example, a torchiere that uses a CFL instead of a hot halogen lamp puts out the same amount of light with a quarter the power—and it's cool enough to touch, reducing fire danger. A new table lamp allows up and down lighting to be controlled independently; at full power it's as bright as a 300-watt halogen torchiere and a 150-watt incandescent lamp combined, but consumes a quarter of the energy.

Siminovitch's personal life mirrors his work. For years he has dressed completely in black, at first because "I didn't want to be a photometric error" in measurements and later because "it makes buying clothes a lot easier." Which saves time for other projects: he and his wife are remodeling their home for maximum energy efficiency, with passive solar heating, superinsulation—and CFL torchieres in every room.

Submitted by DOE's Lawrence Berkeley National Laboratory