INEEL's Sohal takes the heat.

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DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

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Research Highlights . . .

Beryllium sensitivity test fights disease

A two-pronged research effort at DOE's Los Alamos National Laboratory will make it easier to identify people sensitive to beryllium metal and help prevent workers from developing chronic beryllium disease. A Los Alamos team has devised a new, more accurate blood test to identify workers who are sensitized to beryllium. The researchers also have pinpointed genetic markers that indicate increased risk for a small number of workers who are more likely to develop CBD. Los Alamos maintains the DOE's capabilities for research and development in beryllium, a unique metal used in nuclear weapons and, in the commercial sector, for telescope mirrors and golf clubs.

[Kay Roybal, 505/665-0582., k_roybal@lanl.gov]

Bioactive glass coating improves metal bone implants

More than $2 billion is spent yearly in this country on reconstructive surgery involving implants for broken bones. One out of every five of these major surgeries is performed to replace an implant that has failed because metals rub against the bones and do not bond effectively. The lifetimes of artificial hips, knees, and other medical reconstructive devices could be significantly extended with the use of a biologically active silicate glass coating that enables titanium and other metal implants to bond with bone. This special coating will be tested over the next year by Antoni Tomsia and Eduardo Saiz of DOE's Lawrence Berkeley National Laboratory.

[Lynn Yarris, 510/486-5375, lcyarris@lbl.gov]

In search of the missing link: Methanogens and methane

Microbiologists at DOE's Idaho National Engineering and Environmental Laboratory are searching for the link between methane-producing microorganisms and frozen methane gas deep in the ocean floor. Vast amounts of methane gas frozen in ice crystals called hydrates are trapped in the ocean subsurface. Understanding the role of microorganisms called methanogens and the hydrate gas will help determine whether hydrates could become a renewable energy resource for the future. Researcher Mark Delwiche spent on a drilling rig off the coast of Japan to secure core samples that will be the basis of his research for the next year

[Deborah Hill, 208-526-4723, dahill@inel.gov]

Massive detector continues to reinvent itself

The DZero detector at DOE's Fermilab is marching toward the deadline of a year from now to complete its reinvention with new apparatus for observing and recording the collisions of subatomic particles. DZero is a 5,000-ton "Swiss watch" of tiny detector components, and hundreds of thousands of electronic channels, used for recording the results of collisions between protons and antiprotons in Fermilab's Tevatron, the world's highest-energy particle accelerator. The DZero upgrade involves stripping out and rebuilding its electronics systems, and installing the latest generation of the tiny silicon vertex detectors that monitor particle collisions. DZero and its partner detector, CDF, are scheduled to be ready for operation in March 2001.

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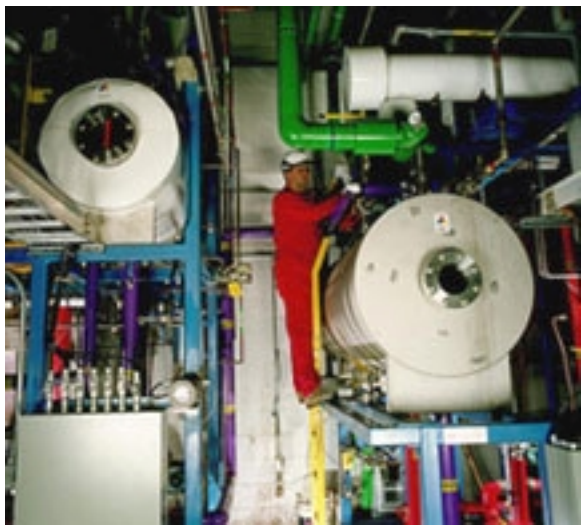
DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***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).

Trash to treasure

The old saying one person's trash is another's treasure isn't just for garage sales.

Researchers at DOE's Pacific Northwest National Laboratory and DOE's National Renewable Energy Laboratory are finding new uses for biomass material such as pulp and paper mill wastes. Working in conjunction with a private company called Biofine, Pacific Northwest researchers have patented a process to produce a fuel additive that makes engines burn cleaner and NREL staff have created a biodegradable herbicide.

Biofine operates a demonstration plant in South Glenn Falls, New York, that converts pulp and paper mill waste to levulinic acid, a chemical "building block", is normally produced from refined petroleum. It now can be produced from biomass at an estimated one-tenth of the cost of using petroleum.



Levulinic Acid Conversion

With funding from DOE's Office of Industrial Technologies, Pacific Northwest and NREL are developing production methods and market applications for specialty derivatives that can substitute for petroleum-based products or be used to create new products.

Pacific Northwest's gasoline additive methyl tetrahydrofuran or MTHF will be used this summer in New York State-owned fleet vehicles as part of a test program. DOE has approved MTHF as a component in "P-Series" fuels that help achieve government targets for alternative fuels usage.

NREL's delta-amino levulinic acid or DALA is a broad-spectrum herbicide/pesticide with a projected market of 200–400 million pounds per year.

The partnership between Pacific Northwest, NREL and Biofine, which includes the New York State Energy Research and Development Authority, promises to lead to a full-scale biomass wastes industry that could transform major sectors of the chemical and fuel manufacturing industries in the United States and abroad from petroleum-based to renewable feedstocks.

The combination of technologies has so much potential that the partnership was awarded the Presidential Green Chemistry Challenge award by EPA in 1999.

Submitted by DOE's Pacific Northwest National Laboratory

Expert on heat transfer takes success in stride

Manohar S. Sohal

Manohar S. Sohal can take the heat. More specifically, the engineer at the DOE's Idaho National Engineering and Environmental Laboratory knows how to make heat flow from one thing into another.

During his 19 years at INEEL Sohal has studied thermal phenomena ranging from the casting of metals to the flow of liquid and vapor mixtures. He has contributed to the safety of nuclear reactors by modeling the interaction between core and coolant and has served as technical project manager for several DOE programs. Before coming to the lab, he helped develop the widely accepted theory of how bubbles form during boiling. Currently, he is trying to improve the efficiency of geothermal power plants by improved heat transfer.

For his many accomplishments Sohal recently was elected a Fellow of the American Society of Mechanical Engineers, an honor he accepts graciously. "It means I'm old," he quips. "Joking aside, it means others think you deserve recognition because it's given by your peers."

Sohal began studying engineering as an undergraduate in India. "If you think back to those days in that country it will tell you the story," he says. "I came from a lower-middle-class family. And engineering was the top profession. It was the most prestigious and highest paying. And, of course, I enjoyed physics and math, there's no doubt about it."

The intellectual challenges of engineering inspire Sohal. "You pretty much have to scratch your head," he says. "Am I doing the right thing? Will this work out? Should I have thought something else? These things are not obvious in the beginning."

In spite of his successes, the soft-spoken father of two keeps his career in perspective. "My family to me is the most important," he says. "Having a happy family life comes first."

Submitted by DOE's Idaho National Engineering and Environmental Laboratory