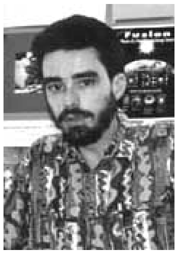


SLAC's Kelsey works software side of street, page 2

DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

Number 17 November 16, 1998

Research Highlights . . .

Semiconductor nanocrystals as fluorescent probes

Some of the more shadowy secrets of biology may soon be illuminated through the use of a new type of fluorescent probe developed by scientists at DOE's Lawrence Berkeley National Laboratory. A joint Berkeley Lab-UC Berkeley research team, headed by materials scientists Paul Alivisatos and Shimon Weiss, has developed nanometer-sized crystals of semiconductors that can be used as fluorescent probes for the study of biological materials. These semiconductor nanocrystals offer a distinct advantage over conventional dye-molecules in that they emit multiple colors of light, which means they can be used to label and measure several biological markers simultaneously over a period of time.

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

Evolution: A sprinkle a day . . .

Perhaps all that separates modern humans from Neandertals is a single genetic alteration and a daily dose of iodine, a paper by Jerome Dobson, of DOE's Oak Ridge National Laboratory, concludes. An improvement in the thyroid's ability to extract and use iodine may explain most differences in body shape and bone structure. In humans, the lack of iodine is known to cause cretinism, the most severe form of iodine deficiency disorder. Modern societies add iodine to table salt, and coastal residents get plenty of iodine from saltwater fish, shellfish and seaweed. Dobson theorizes that Neandertals living in inland Ice Age Europe might have lacked an adequate supply of iodine.

[Ron Walli, 423/576-0226, wallira@ornl.gov]

Super-powerful computer developed

In a White House ceremony, Vice President Gore announced delivery to DOE's Lawrence Livermore National Laboratory of ASCI Blue Pacific, a supercomputer capable of nearly four-trillion operations per second. IBM delivered the massive machine, with more than 2.6 trillion bytes of memory, six months early. Inside, thousands of coupled processors run large calculations in parallel by dividing them into smaller problems, solving them simultaneously, then reassembling them into an integrated solution. During a record-shattering September demonstration, the equipment ran a complex turbulence-simulation code at a sustained rate exceeding a trillion calculations per second, while processing more than 70 billion zones simultaneously.

[Jeff Garberson, 925/423-3125, jbg@llnl.gov]

Geothermal Heats Up

A promising technology developed by DOE's National Renewable Energy Laboratory to increase the efficiency and production capacity of geothermal power plants was demonstrated at the Geysers, the world's largest geothermal power plant in northern California. After the advanced direct-contact condenser technology was installed at one of the plant's operating units, its power production efficiency increased by 5 percent and potential power capacity increased by 17 percent. NREL recently entered into an agreement to license the technology with Ecolaire of Easton, Pa. Ecolaire supplies 70 percent of U.S.-manufactured geothermal condensers to worldwide markets.

[Patrick Summers, 303/275-4050, patrick_summers@nrel.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).

Mixed plastics go their separate ways

Froth flotation may sound like a new drink at your neighborhood Starbucks, but it's actually a new tool for saving landfill space.

An Argonne process based on "froth flotation" provides, for the first time, an industrial-scale method for separating plastics of equivalent density, making it possible to recover high-value products from mixed plastics.

Argonne developed the process to separate two common forms of plastic material—acrylonitrile-butadiene-styrene (ABS) and high-impact polystyrene (HIPS)—in waste from auto and appliance recycling. The process, now being pilot-tested, could unlock many valuable sources of plastic. For example, 570 million pounds of ABS and HIPS go to landfills annually in waste from auto and appliance recycling; at present, virgin ABS sells for $1.00 per pound.

One difficulty in "mining" high-value plastics from discarded products is that many plastics have the same physical characteristics and density and so cannot be separated from each other by current production methods. Froth flotation allows two or more equivalent-density plastics to be separated with high purity. The resulting products are of commercial quality and would be priced competitively with virgin materials.

The froth flotation technique uses the wetting characteristics of plastic materials as a basis for separating ABS and HIPS plastics. Controlling the chemistry of a solution permits the wetting characteristics to be adjusted selectively. By changing the surface wetting characteristics of equivalent-density plastic materials, small gas bubbles can be attached to one material's surface, reducing its effective density. Because of the lower effective density of the bubble-plastic particles, the plastics will float in an appropriate solution.

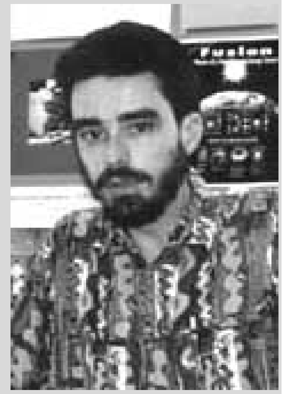
This process has been successfully demonstrated in batch-scale tests to produce high-purity (>99%) ABS. To further evaluate the technical and economic performance of this process, a 1000-pound-per-hour pilot plant for recovering ABS and HIPS from appliance plastic waste has been built in Minneapolis at a plant owned by Appliance Recycling Centers of America, Inc.

Argonne's research was supported by the Department of Energy, Energy Efficiency and Renewable Energy, Office of Industrial Technologies.

Submitted by DOE's Argonne National Laboratory

Argonne's "froth flotation" process could recycle waste into valuable plastics.

Working the Software Side of the Street



Mike Kelsey could be a recruiter for several colleges. He did his under-graduate work at UCLA, then went to Cal Tech for his graduate work. After a stint in a foreign country (University of British Columbia), Mike is now Research Staff at Princeton, proudly wearing the Orange and Black and rooting for the Tigers.

But through it all, Mike has been at DOE's SLAC. For 12 years, as a matter of fact, which is quite an accomplishment for a fellow of thirty-something. Starting at SLAC in 1986 as an undergrad, Mike then started working on computer code for the SLAC Large Detector in 1988.

"We've made big changes since then," says Mike. "We're capitalizing on the process and the infrastructure created for that project, so it's not a completely new learning curve." His current work on the BaBar detector, part of SLAC's B Factory, can't use the old Fortran code from 10–15 years ago. "Now we're using C++ and Object Oriented programs, plus some commercial products," he says.

"We are now more linked to physics worldwide. We're using tools from other labs, such as CERN and FermiLab," says Mike. Cooperating with another lab for software can have its downside, however. "There's less control over bugs and other modifications," says Mike, "but we think that the collaborative aspect outweighs such problems." Mike is careful to point out that this is his opinion and not all his colleagues may share the same point of view.

Mike's plans include remaining affiliated with SLAC during the physics of the B Factory for many years to come. "After the B Factory, we hope a next-generation linear collider provides more physics opportunities ahead."

Submitted by DOE's Stanford Linear Accelerator Center