



Ranjani Siriwardane's tiny pellets:

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Research Highlights . . .

Brookhaven launches MRI study of multiple sclerosis

The search for clues about multiple sclerosis (MS)—a chronic, often disabling disease of the brain and spinal cord—got a significant boost from a \$613,687 grant to Brookhaven National Laboratory from the National MS Society. The grant will fund a three-year magnetic resonance imaging (MRI) study looking for early signs of the disease using BNL's powerful 4-Tesla MRI scanner. More than twice as powerful as a typical hospital scanner, Brookhaven's machine will allow scientists to search for subtle changes in blood vessels that precede MS. Understanding these changes could lead to more effective diagnosis and treatment.

[Karen McNulty Walsh, 631/344-8350, kmcnulty@bnl.gov]

Light and air allow friendly chemical reactions

Andreja Bakac, a chemist at the DOE's Ames Laboratory, is performing safe and simple chemical reactions with hydrocarbons that could change how industrial chemicals are produced, making the process more efficient, economical and environmentally friendly. Hydrocarbons could become an important feedstock for the chemical industry if they can be made more reactive, says Bakac. She uses energy from light, which is cleaner and cheaper than heat, to drive the hydrocarbon oxidation reactions. Atmospheric air is the oxidant, and depleted uranium serves as the photosensitizer, absorbing the light needed to drive the reactions.

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Lengthening the arm of the law with biochips

The use of biochips to make DNA-typing an even more effective crime-fighting tool is the focus of cooperative work between Illinois State Police Department forensics experts and researchers at DOE's Argonne National Laboratory. Collecting and analyzing the evidence that will find and convict a criminal is a painstaking and time-consuming process. Argonne's biochip technology offers the prospect of faster DNA analysis, even with samples that are difficult to handle. The researchers have developed and are testing specially designed biochips which contain probes for mitochondrial DNA. The test may be available for casework in a couple of years.

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Planned LEP shutdown leaves clear field for Fermilab

With the announcement that the Large Electron-Positron collider at CERN has been turned off "for the last time" on November 2, the focus on the search for the Higgs particle landed squarely at the Department of Energy's Fermilab. Scientists at Fermilab refer to the "Higgs mechanism," the particle or particles proposed by Scottish physicist Peter Higgs that give rise to the quality of mass in all other particles. Fermilab will begin Collider Run II of the Tevatron, the world's highest-energy particle accelerator, in March 2001. LEP will be replaced by the Large Hadron Collider later this decade.

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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).

No bull: There's value in farm animal waste

We're not likely to ever run short. Often it's a problem, but it could be a strong renewable energy resource candidate. We're talking about [farm animal manure](#). As the animal farm industry has concentrated more and more production on smaller parcels of land, handling the manure has become a more serious pollution issue.

But that manure, says [John Sheffield](#), a researcher at [DOE's Oak Ridge National Laboratory](#), also represents a gold mine as an energy source, if the farmers can get enough economical and technological help in putting it to better use.

"In the past, a small animal farm could be a more or less closed ecological system. The manure was the fertilizer for the crops used to feed the animals. Now operations are larger and more concentrated and the feed may come from producers far away. For example, corn grown in the Midwest feeds animals in the East. Unfortunately, the manure as an unmodified fertilizer is much less valuable than the feed. Therefore it is not economic to ship it back."

Today, many farms spread the manure on local fields. But those fields may already be saturated with phosphates, and the runoff pollutes stream, rivers and the water system generally. The problems are compounded by the presence of both pathogens and antibiotics in the manure. The odor and dust from the animal farm operations is also seen as a public nuisance and a health hazard.



Fortunately, it is a problem that, he says, is "absolutely fixable." Ultimately, it may be fixed at a profit using modern technologies and systems, many of them from ORNL and other DOE laboratories. Work in this area has received a boost with the President's bio-based products

and bio-energy initiative for commercialization of technologies and the Lugar bill for research, development and deployment.

"Animal manure has value," he says. "The United States produces 1.4 billion tons of wet manure a year, or more than 200 million tons in dry weight. The solids have value: as fertilizer, because it is rich in phosphates, and as an energy source. Those 200 million tons of manure contain energy equal to the energy in about 100 million tons of coal, roughly 10 percent of U.S. annual coal use.

"A whole range of products could be produced from waste that could recover three or four cents of every five spent in recycling. We need industry-based support that doesn't put the load on the farmer. The technology providers should take the risk, and it will require government help. You have to prime the pump," he says.

Through the University of Tennessee's [Joint Institute for Energy and Environmental Studies](#), ORNL, the Tennessee Valley Authority and UT's College of Agriculture have been discussing various approaches for helping farmers convert their manure into a productive resource.

Submitted by [DOE's Oak Ridge National Laboratory](#)

RESEARCHER'S TINY PELLETS TURN INDUSTRY HEADS

Good things come in small packages; there's strength in numbers—those are just a few of the clichés that could be used to describe a simple answer to a complex problem solved by a researcher at [DOE's National Energy Technology Laboratory](#).

The simple answer is a new invention called RVS-1: the regenerable desulfurization sorbent patented by NETL senior scientist Ranjani Siriwardane. The invention, a sorbent contained throughout a sphere about one-



Desulfurization sorbent pellets

half the size of a pencil eraser (about 3 millimeters in diameter), provides power generators with a solution to sulfur emissions from their facilities.

Because of its impact on coal-fired electricity generation, the invention captured R&D Magazine's R&D 100 award, emblematic of the 100 most significant technology developments of this year.

Dr. Siriwardane began her federal career in 1988 but launched into a research project in 1992 to address a 20-year-old problem associated with sorbents: how does one keep the sorbent pellets from breaking apart during regeneration. Costs rose precipitously when existing pellets broke apart and lost strength during reuse. A major part of the explanation was that the existing pellets tended to expand when reacted with sulfur. As a result, a new pellet was needed that could accommodate the expansion.

During tests, Dr. Siriwardane's RSV-1 withstood the expansion, actually became stronger after a run through 50 cycles, efficiently removed nearly all the sulfur, and at costs up to 50 times less than competing products.

Dr. Siriwardane's invention has not gone unnoticed by commercial ventures. Sud Chemie (formerly known as United Catalysts Inc.), Louisville, Kentucky, has the exclusive right to produce RVS-1 and has in fact already sold some of the product. The sorbent can also be used to remove sulfur from non coal-derived gas streams. The U.S. Navy is exploring the use of fuel cells as a shipboard power source. The RVS-1 sorbent has proven that its use will ensure that reformed diesel fuel gas is free of sulfur which would poison fuel cells.

Submitted by [DOE's National Energy Technology Laboratory](#)