Tech Transfer *Highlights*

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Argonne National Laboratory

The latest technological innovations and scientific advances from Argonne National Laboratory

Many Argonne technologies are available for commercialization under a variety of agreements. For more information, contact the Industrial Technology Development Division (800-627-2596, partners@anl.gov). Visit the ITD web site at http://www.techtransfer.anl.gov. For Media Relations, contact Catherine Foster (630-252-5580, cfoster@anl.gov).

Argonne R&D Partner Sells New Weld Monitors to DaimlerChrysler

U.S. Department of Energy

Office of Science, Laboratory Technology Research Program

Office of Transportation Technology

Success Story!

Laboratory demonstration of Argonne's new "real-time" infrared weld monitor.

A new infrared laser welding monitor developed by Argonne and its industrial partners, then further tested and commercialized by Spawr Industries (Lake Havasu City, Ariz.), is starting to help U.S. auto manufacturers produce better-welded parts at lower cost. Spawr Industries, an Argonne cooperative research and development (CRADA) partner, offers the weld monitor as an off-the-shelf product and is scheduled to install 13 of the units in the Kokomo, Ind., DaimlerChrysler transmission plant. The system is replacing the plant's old ultrasonic weld testing equipment and has already been shown to decrease the plant's scrap from bad welds by 10 percent. It also features "real-time" operation to reduce processing time.

If the monitor detects welds that are not deep enough to form a strong bond, it can automatically signal the welding unit to correct system parameters. Economical ($17,000 per unit) and easy to operate, the system uses a passive sensor with integrated optics that measures infrared emissions from a weld. The previous weld inspection system required immersing bulky parts in dunk tanks for ultrasound testing – with the old units each costing $23,000, as well as another $100,000 for probes and automation.

The laser welding research that led to the development of the weld monitor was conducted under two CRADAs, one between Argonne and Delphi Energy & Engine Systems (Flint, Mich.), and one between Argonne and the USCAR Low Emissions Partnership, comprising DaimlerChrysler, Ford, and General Motors.
http://www.techtransfer.anl.gov/partners/daimlerchrysler.html

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Approach Puts New Spin on Computer Memory Technology

U.S. Department of Energy

Office of Science, Materials Sciences Division

Research at Argonne suggests that the next leap forward in RAM and CPU technology for computers could be a switch from electronics to "spintronics" – magnetically based memory storage and processing. Today's electronic RAM and CPUs are based on semiconductors, which use an electron's charge (positive or negative) to store and process information. But turn off the power, and the charge disappears along with the information. That's why computer users have to save data to a magnetic hard drive before shutting down a computer.

Magnetic spintronic devices, on the other hand, would use an electron's spin to store information. Magnets tend to stay magnetized when power is shut off. If RAM and CPUs were spin-based, users would not have to save data before shutting down and "boot up" time would be reduced to only a few seconds. Argonne's approach uses voltage changes to flip the spins of the electrons – the storage elements in magnetic RAM devices – up or down to represent the zeros and ones of binary computer language. By combining this with another Argonne idea – magnetic, programmable CPUs – it could be possible to create pocket-sized computers more powerful than today's most advanced machines.
http://www.techtransfer.anl.gov/techtour/spintronics.html

New Technologies Help Dilute Streams and Constituents Go Separate Ways

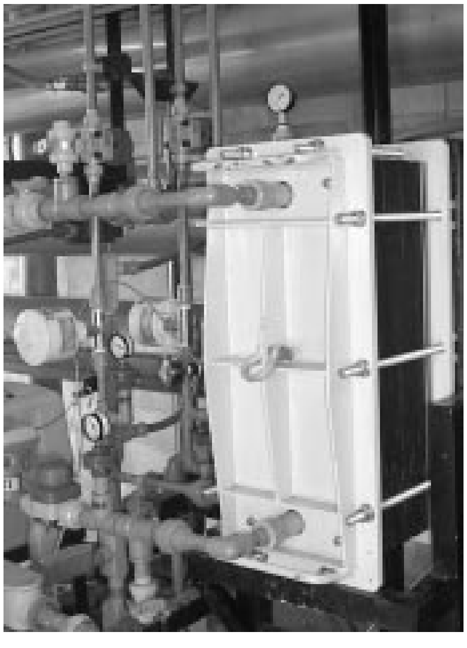
U.S. Department of Energy

Office of Energy Efficiency and Renewable Energy

Office of Environmental Management

Argonne and industry partners have developed practical "system-level" solutions for removing and/or recovering constituents from dilute process and waste streams. A stream, whether liquid or gaseous, is said to be "dilute" if it contains less than five percent of a solute that must be recovered, removed, or concentrated. Conventional separation technologies have high capital and energy costs and are not always cost-effective for industrial applications. Argonne's technologies provide more energy-efficient, economical removal and recovery of solutes.

For example, Argonne has developed system-level solutions for removing and recovering metals, salts, and organic species from aqueous streams. An economical electrolysis method of removing salts from process waters has been demonstrated for the textile and the pulp and paper industries. Argonne has shown that recovering dyes in the textile industry is feasible with ultrafiltration membranes and biphase extraction technologies. The technologies developed for nuclear programs at Argonne include novel separation methods for recovering metals from aqueous streams. One such method is centrifugal solvent extraction, which could be used to concentrate dilute high-value constituents for economical recovery, such as precious metals or pharmaceutical products.
http://www.techtransfer.anl.gov/techtour/dilute.html



This prototype electrodialysis membrane unit recovers salt from the process water in an operating textile mill.

Creating Inexpensive Exotic Alloy Coatings for Complex Shapes

Argonne materials scientists have developed a new method that could reduce the production cost and weight of components that are subjected to high temperatures, great mechanical stress, or highly corrosive environments. The continuous process coats complex shapes with specialized alloys. It can put an alloy coating on inexpensive metal substrates or make strong, lightweight composites from an alloy-reinforced mesh of tiny carbon fibers. Components then need little or no machining to achieve their finished shape. Possible applications include any application of Monel, a widely used but expensive copper-nickel alloy; aircraft and jet-engine components; spacecraft components, such as fuel tanks; components currently requiring carbide coatings, such as machining bits; and any application of galvanized steel, such as in auto bodies.

Argonne's continuous process is more efficient than batch processing and uses less energy than casting specialty alloy components. The process also minimizes the amount of specialty alloy needed and eliminates melting and casting operations. While still in development, current research suggests the process to be effective with binary alloys that form solid solutions. Further research is needed on applying the method to ternary alloys and intermetallics and on scaling the process for production use.
http://www.techtransfer.anl.gov/techtour/alloycoat.html

Advanced Diesel Desulfurization Catalysts May Lead to Ultra-Clean Fuel

U.S. Department of Energy
Office of Fossil Energy (Tulsa)

New diesel fuel desulfurization catalysts have been identified by Argonne scientists. Sulfur is generally an undesirable component in diesel fuel because it creates corrosive combustion by-products, releases sulfur oxides into the atmosphere, and increases deposits on fuel injection and combustion systems. Current desulfurization technology uses catalysts to add hydrogen and typically requires costly high-pressure (350 - 1,000 psig), high-temperature (400 - 550°C) hydrodesulfurization (HDS) equipment. Argonne researchers synthesized and tested several new catalysts at 400°C and 400 psig, and believe it may be possible to achieve optimal processing using less expensive equipment at lower temperatures and/or pressures – even for heavier crude oils.

The project modified the geometry of pores in different catalyst materials to increase their HDS selectivity for larger and more structurally complex crude oil molecules, which are more difficult to desulfurize. Argonne researchers heated mesoporous structured clay (MSC) catalysts in air to burn out organics and create uniform pores of the proper dimensions for heavy oil processing. The synthesized catalysts have to date been tested only for HDS of dibenzothiophene (a component in heavy oils), but new funding will be used for testing these catalysts on a full range of heavy oil components.
http://www.techtransfer.anl.gov/techtour/desulfur.html

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Toroid Cavity Imager Provides Inside Story on Containers

U.S. Department of Energy
Office of Science, Basic Energy Sciences
Office of Environmental Management

Argonne's toroid cavity imager (TCI), an imaging device based on nuclear magnetic resonance (NMR) technology, identifies and locates chemical compounds inside closed containers by measuring how the contents respond to a magnetic field. The technology was originally developed as an NMR analytical tool and then for safe examination of stored nuclear wastes. It also has potential applications for nondestructive inspection of the contents of any type of container or package that can be placed inside a cylindrical test chamber, such as packaged foods (for freshness), industrial materials (for safety), and shipped or mailed items (for safety and security).

Argonne's TCI accurately quantifies a container's contents, with up to one-micrometer spatial resolution and with high sensitivity in distinguishing among chemical elements and compounds. Moisture, by-products from degradation or spoilage, and chemical shift reactions are detected and measured instantly, without opening or destroying the package or product. This technology has already been used at laboratory scale to study ion diffusion in batteries and various catalytic reactions. Suitably scaled, the technology is applicable to any container, of any size.
http://www.techtransfer.anl.gov/techtour/nmr-imager.html

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