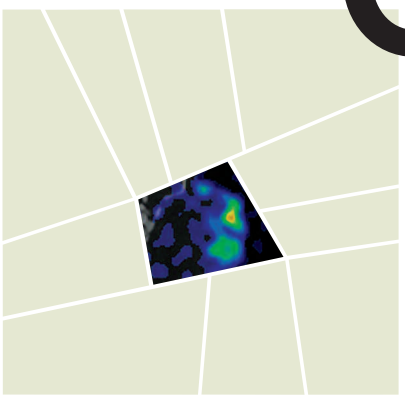
Chemistry and Chemical Engineering



environmental engineering • demilitarization • materials chemistry • process engineering • analytical & environmental chemistry • pharmaceutical chemistry • environmental sampling • fire protection engineering • risk & hazard analysis • fire testing & research • microencapsulation • biomaterials engineering • analytical method development • homeland security • health effects & epidemiology investigations

D015517-8771

A new 4,300-square-foot building provides indoor space for large-scale fires with heat release rates in excess of 25 megawatts. A pollution abatement system reduces particulate emissions, and an elevated control room enables enhanced test monitoring. The adjustable-height ceiling simulates various-sized structures.

Southwest Research Institute serves its government and industry clients by providing novel chemistry and chemical engineering solutions using advanced facilities and multidisciplinary expertise. In 2006, we made advances in alternative energy processes, drug delivery technologies, biomaterials and nanotechnology applications, and continued work with chemical demilitarization and homeland security programs.

As part of the national hydrogen initiative, our fire technology engineers are studying safety issues associated with the storage and use of hydrogen as a vehicle fuel. We are studying fires associated with leaks and catastrophic failure of compressed hydrogen cylinders, as well as assessing the safety of metal hydride storage concepts. In work for the National Highway Traffic and Safety Administration, we are verifying standard test methods used to assess the safety of compressed hydrogen cylinders.

Heightened concerns about global warming are driving technologies to reduce greenhouse gas emissions from utility power plants. SwRI engineers are helping a start-up company develop and demonstrate their patented technology to sequester carbon dioxide emissions using integrated chlor-alkali scrubbers and regenerative electrochemical cells. A pilot plant was installed at a Texas coal-fired power plant to gain operational experience and measure the economic parameters of the process.

In collaboration with The University of Texas Health Science Center at San Antonio, SwRI is developing controlled-release capsules containing radiolabeled

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SwRI scientists are expanding our accelerated exposure capabilities to include ozone exposure, battery outgassing and evaluating household products under corrosive atmospheric conditions.

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We are evaluating the damage associated with a 5,000-pounds-per-square-inch hydrogen cylinder rupturing beneath an automobile as part of a program to investigate safety hazards associated with storage technologies. Data collected include infrared and high-speed photography as well as temperature and blast wave measurements.

liposomes to treat and image tumors. When implanted into a tumor, the capsules release the liposomes over a prolonged period. The research is aimed at better distribution of the radiotherapy directly to the targeted cells to increase therapy effectiveness and reduce the dose and any associated adverse effects.

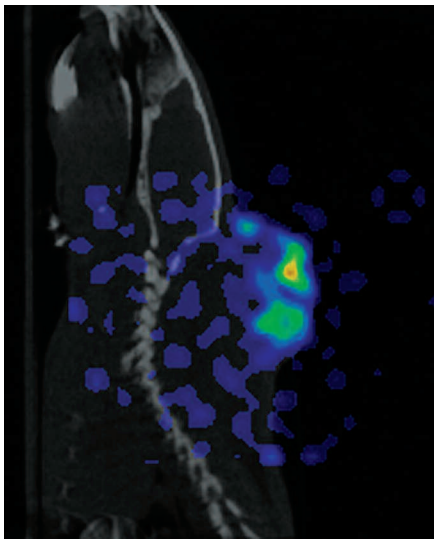
SwRI is leading the process development for a new broad-spectrum nerve agent antidote for the Department of Defense. In 2006, SwRI led the development and scale-up of the manufacturing process and will produce the formulation for clinical trials in 2007.

The closure and cleanup of Department of Energy facilities have expanded the need for chemical analysis and characterization of highly radioactive mixed waste and environmental samples to assess the appropriate disposal options. To meet this national need, SwRI enhanced its capability to handle highly radioactive samples and developed methods to analyze trace contaminants in these complex matrices.

Many U.S. companies now import pesticides and herbicides from foreign countries. To protect workers, the public and environment, these products must still be registered under the Federal Insecticide, Fungicide and Rodenticide Act. SwRI chemists analyze pesticides for active ingredients and possible contaminants using rigorous quality control procedures and trace analysis techniques required under strict Good Laboratory Practices.

Our scientists and engineers continue providing broad support to the U.S. program to destroy the chemical agent stockpiles in compliance with the international chemical warfare treaty. In addition to conducting workplace and environmental monitoring at destruction facilities, we are conducting bench-scale investigations to characterize caustic-neutralized agent for potential transport to offsite disposal facilities. SwRI is also completing a multiyear program to create standardized analytical methods for chemical warfare agents for the U.S. Army. The Environmental Protection Agency is evaluating these methods for use by first responders and other homeland security laboratories. ❖

Visit chemistry.swri.org for more information or contact Vice President Dr. Michael G. MacNaughton at (210) 522-5162 or michael.macnaughton@swri.org.



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SwRI scientists, in collaboration with UTHSCSA, are studying the controlled release of radionucleotide-containing liposomes for the treatment and imaging of tumors. The figure shows the distribution of labeled liposomes in a tumor-bearing animal model, where bright areas correspond to high liposome concentrations.

D015006-0036

To help reduce the country's dependence on foreign oil, Institute engineers are conducting a multimillion-dollar project to generate conventional liquid transportation fuels from natural gas. This gas-to-liquids process has tremendous potential for expanding resources that can be converted to new fuels for the U.S. and the world.