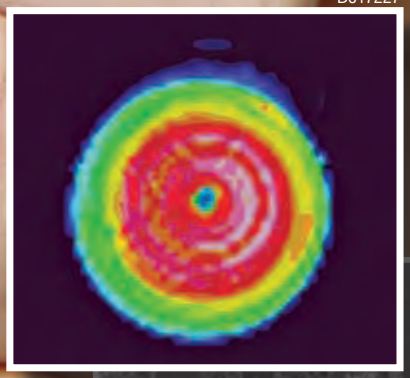
Chemistry and Chemical Engineering

A new pyrolysis combustion flow calorimeter allows SwRI fire specialists to cost-effectively evaluate the ignition and heat release rate characteristics of various plastics using milligram-sized specimens.



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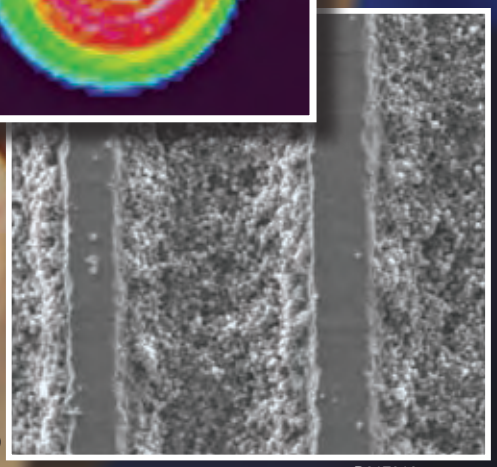

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2 D016489-4611

3 D017229

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

Southwest Research Institute develops advanced chemistry and engineering solutions to meet global challenges in areas ranging from new energy solutions to pharmaceutical development to fire technology (chemistry.swri.org). Working with industrial and governmental clients, we also address environmental, food safety and homeland security concerns.

In the case of terrorist chemical attacks, it is critical to quickly identify and pinpoint whether explosives or chemicals were manufactured in foreign states or in domestic clandestine laboratories. SwRI is developing new hyperabsorptive sampling materials and new forensics techniques to correlate chemical signatures with specific geographical regions or, in some cases, a specific manufacturer. Other ongoing programs utilize high-resolution mass spectroscopy and gas and liquid chromatography to survey air, soil, water and other matrices for the presence of chemical warfare agent decomposition signatures at levels in the parts per trillion.*

SwRI continues to support programs to destroy the nation's chemical agent stockpiles, including the final closure of the Newport, Ind., demilitarization plant. San Antonio laboratory personnel analyze samples at each stage of closure to ensure no residual chemical agent or toxic decomposition products are present prior to release of facility equipment and buildings. Pine Bluff, Ark., and Umatilla, Ore., chemical agent disposal facilities completed destruction of VX and sarin nerve agents and began destruction of the final chemical agent, mustard-based blister gas.

SwRI chemists and scientists provide a spectrum of services to assess food safety and quality for the entire food industry, from the farm to the fork. SwRI implemented dispersive solid-phase extraction techniques, which allow for sample extraction and interferent cleanup in fewer steps, using less solvent, to analyze complex food samples more quickly while reducing laboratory costs and waste.

For more than 60 years, we have advanced the state of the art in micro- and nano-encapsulation technologies for applications in the personal care, food, pharmaceutical and other consumer product industries (microencapsulation.swri.org). We are developing the next generation of countermeasures for chemical defense, applying micro- and nano-stabilization technologies to improve chemical weapons antidotes and biological defense-related therapeutics (drugdelivery.swri.org). These include developing a pipeline of therapeutic countermeasures as well as clinical supplies of therapeutics. Beyond particle-based drug delivery, SwRI is also creating drug-eluting materials that can be used as coatings or scaffolds and promising new treatments for bone fractures.

To help the fire protection community accurately model fire growth in enclosures, SwRI fire specialists are helping the National Institute of Standards and Technology develop a guide for obtaining ignition, flame spread, burning rate, combustion products and thermophysical material properties. SwRI scientists are also evaluating the ignition and explosion hazards of hydrogen leaks from a fuel-cell powered vehicle in a residential garage. The ignition source in these tests represents an electrical fault in a garage door opener. The data will be used to validate computer models developed by NIST to simulate the dispersion of hydrogen and predict ignition and the effects of an explosion. To help the military meet Environmental Protection Agency reporting requirements, SwRI also conducted a series of large pool fire tests to determine the emissions associated with extended burns of JP-8 aviation fuel (fire.swri.org).

To support the energy industry, the Institute is operating a large outdoor pilot plant that converts natural gas to useful hydrocarbon liquids and is developing process safety management protocols for facility operations. We also developed a process to reclaim ethylene glycol used for flow assurance in long-distance gas transmission pipelines. ❖

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

1. *SwRI is developing novel sorbent-coated etched rolled films, providing a high-surface-area, low-pressure-drop platform to sample atmospheric impurities in concentrations ranging from 100 parts per million to 10 parts per trillion. Several coated SCERFS stacked in tubes provide a multi-adsorptive material approach, capturing a wide range of analytes, which can be rapidly extracted by resistively heating the SCERFs (inset).**

2. *In 2009, we developed and manufactured a Phase I chemotherapeutic drug and prepared key intermediates for later-phase drug trials in our cGMP facilities. We also developed capsules, a drug releasing implant and a lyophilized injectable product.*

3. *SwRI recently commissioned this heavy oil upgrade test facility to evaluate converting heavy or residual petroleum into high-quality synthetic crude oil.*

*DOD Distribution Statement A: Approved for public release; distribution is unlimited.