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SRNL DEVICES FOR COLLECTING AIRBORNE MATERIAL RECEIVE PATENTS

AIKEN, S.C. – Two devices developed by Savannah River National Laboratory researchers for collecting airborne particles, including chemical agents and microorganisms, have recently been issued patents. Both the Aerosol-to-Liquid Particle Extraction System (ALPES) and the Aerosol Contaminant Extractor (ACE), which collect particles so they can be analyzed, could have wide application in homeland security and law enforcement.

The two work in different ways, the ALPES using a liquid to concentrate particles, and the ACE depositing the particles on a

charged plate for off-line analysis. Both are highly efficient, portable devices that are able to collect most any aerosol, including chemical agents; radioactive particles; microorganisms (such as spores, bacteria, and fungi); residual substances from explosives; and byproducts of manufacturing processes (such as lead in a battery factory). An array of units, deployed throughout a public or private facility, could be a vital part of an anti-terrorism alert system.

“SRNL’s role has always been to put science to work to create practical solutions for real-world needs,” said Laboratory Director Dr. G. Todd Wright of Westinghouse Savannah River Company. WSRC, a subsidiary of Washington Group International, operates SRNL for the U.S. Department of Energy. “With these devices, we are providing tools that could provide enormous benefit for homeland security.” Previous technologies for collection of airborne particles are larger and heavier, have higher power demands, are noisy, and cannot maintain the viability of biological agents.

Like many SRNL inventions, they have applicability, not just in the high-profile field of homeland security, but also in less exotic uses where it is important to detect and identify unwanted substances in the air. For example, ALPES or ACE could be effectively deployed to monitor for harmful airborne particles in locales such as manufacturing facilities, clean rooms, cruise ships, sea borne containers, food production facilities, and grain elevators.

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Both devices are briefcase-sized, making them easily portable, and can operate off a 12 volt battery or be adapted to use available power sources. Their quiet operations allow them to be used inconspicuously.

SRNL's Dr. Cliff Carlson, along with Dr. Justin Halverson and Jeff DeGange, designed ALPES to collect airborne agents and concentrate them in a liquid sample for analysis. It is specifically designed for particles in the range of 0.3 to 2 microns, which is the size range of most concern for chemical, biological, and radiological hazards presented by terrorist weapons. The ALPES collection system, when connected to an online analyzer, could make it possible to quickly notify authorities of the existence of harmful biological, chemical, or explosive materials in the area. Its practicality and potential for making a significant contribution to society earned ALPES an R&D 100 Award in 2003; each year, this award recognizes the year's 100 most technologically significant new inventions.

The device uses an electrical charge to attract airborne particles to a collection tube, where it is collected by recirculating liquid. A valved sample loop allows the liquid containing the contaminants to be diverted to an online analyzer, or to a sample vial for transport to a laboratory for analysis. The liquid can be customized, depending on what types of particulates are of interest. For example, a saline or nutrient solution will keep biological agents viable, enabling faster and more accurate analysis.

ACE, invented by Dr. Carlson, Dr. Paula Cable-Dunlap and DeGange, collects particles onto a charged plate, which can be removed for analysis. The device is contained in a box that has been fitted with motor-driven doors, which open when the unit is turned on. The device is designed such that it can be mounted on a robot, so it can collect particles in areas that are too dangerous for a human to enter.

In 2004, NASA deployed the device to explore the interior of the Chilean Atacama Desert, the most arid region on Earth, to search for airborne microbial life. ACE could be one of an array of instruments that joins future missions on the Space Station. It has also been used to collect bacteria at cooling towers to determine the presence of Legionella (the bacteria associated with Legionnaire's Disease).

WSRC is interested in talking with companies that are interested in licensing the devices for manufacture and marketing. The U.S. Patent & Trademark Office issued U.S. Patent No. 6,955,075 for ALPES on Oct. 18, and U.S. Patent No. 6,964,189 for ACE on Nov. 15.

SRNL is the applied research and development laboratory at the U.S. Department of Energy's Savannah River Site, providing science-based solutions in the areas of national and homeland security, energy security, and environmental remediation and protection.

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