tech briefs

Westinghouse Savannah River Company

New device collects deadly agents for quick identification

2003 R&D 100 award winner!

Aerosol-to-Liquid Particle Extraction System (ALPES)

at a glance

- Collects microorganisms, chemical agents, radioactive particles
- > 90 percent collection efficiency
- Collects particles of < 0.3 to 10 micron diameters
- Maintains viability of live agents
- 300 liters per minute flow rate
- Consumes < 12 watts of power
- Uses a 12 volt battery
- Measures 6” x 10” x 21”
- U.S. patent pending

for more information

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A new device uses electrostatic precipitation to collect and concentrate airborne agents in a liquid sample for onsite or laboratory analysis. The collection efficiency is 85 percent to 92 percent depending on the size of the particles.

The Aerosol-to-Liquid Particle Extraction System (ALPES) is designed to collect chemical agents; radioactive particles; microorganisms such as spores, bacteria, and fungi; and molecules and other substances associated with explosives.

Quick detection can save lives

Agents that could be used in chemical and biological warfare tend to disperse widely in the air when released. Quickly collecting a concentrated sample of these agents is critical to detecting them before they reach harmful dose levels in the air. Also, methods of detection such as by polymerase chain reaction are enhanced when the collected agents remain alive.

Other collection devices using wet cyclone designs are larger and heavier, have higher power demands, and are noisy, thereby precluding unobtrusive uses. Devices using impactors for collection do not maintain the viability of live agents.

Uses proven particle separation technique

The new ALPES takes advantage of the long-proven use of wet electrostatic precipitation to separate particles from air. The device comprises an ionization section atop a tubular collection electrode enclosed in a column. A pump pulls air through the vertical column at a flow rate of up to 300 liters a minute.

Recirculating liquid concentrates collected agents

A reservoir at the bottom of the column contains liquid that is pumped up through the inside of the collection tube, which is charged at 8,000 volts. The liquid flows over the top of the charged tube and down the sides, collecting the ionized particles from the outside surface of the tube. The flow rate maintains a continuous film of liquid on the outer surface of the tube. Constant recirculation of the liquid through the tube concentrates the collected particles.

A valved sample loop enables diversion of the liquid to an online analyzer or to a sample vial for transport to a laboratory for analysis.

Low power, quiet operation

With minimal pressure drop, the device consumes less then 12 watts of power and operates quietly.

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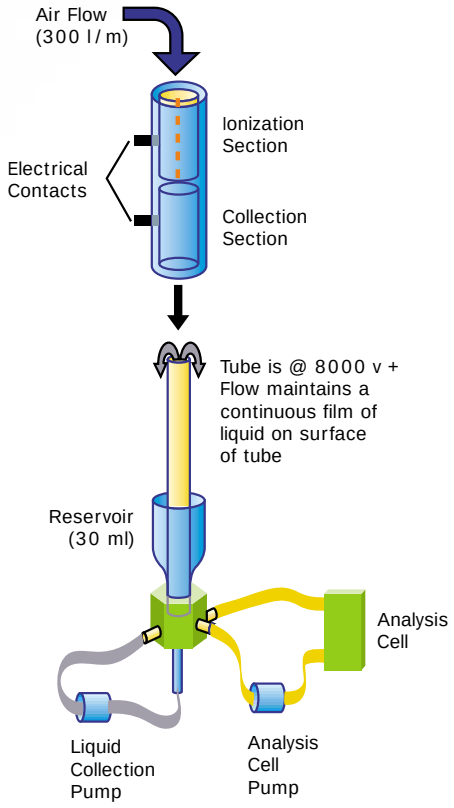
Aerosol-to-Liquid Particle Extraction System (ALPES)



Adaptable for selected analyses

The recirculating liquid can be customized for specific situations. A buffered saline solution or a nutrient solution will maintain biological agents in a viable state, enabling faster and more accurate analyses. Or, the liquid could be a scintillation cocktail. An analyzer with a photodetector tube could then measure activity in the cocktail. As another example, the liquid could include colorimetric materials. An analyzer with a colorimetric cell could then provide data relating to the collection of analytes.

Easy to carry, easy to conceal

Measuring 6" x 10" x 21", the briefcase-size ALPES is easily portable. It can operate off of a 12 volt battery. The device can be adapted to use an onsite power source or any variety of specialized power sources such as solar panels. Use of a communications device, such as a simple radio transceiver, enables operation of ALPES from a remote location. Data from an online analyzer may be transmitted to a remote location.

ALPES can be wall-mounted for inconspicuous operations in facilities such as hospitals, post offices, convention centers, and stadiums.

Built to maintain sample integrity

The use of modular construction enables components in direct contact with collected samples to be cleaned or easily replaced between sample collections to avoid sample cross-contamination.

Harmful bacteria collected in field tests

A prototype ALPES successfully collected *Legionella pheumophila* at the cooling towers on the Savannah River Site.

In another test, ALPES collected spores of the bacterium *Bacillus thuringiensis* 200 meters from their source. These spores are about the same size as spores of various microbes that may be used as biological weapons, such as anthrax.

Partnering opportunity

A U.S. patent application has been filed on the ALPES device and method.

Westinghouse Savannah River Company (WSRC) invites interested companies with proven capabilities in this area of expertise to enter into a licensing agreement with WSRC to manufacture and market this device as a commercial product. Interested companies will be requested to submit a business plan setting forth company qualifications, strategies, activities, and milestones for commercializing this invention. Qualifications should include past experience at bringing similar products to market, reasonable schedule for product launch, sufficient manufacturing capacity, established distribution networks, and evidence of sufficient financial resources for product development and launch.

Technology transfer

WSRC is the managing contractor of the Savannah River Site for the U.S. Department of Energy. WSRC scientists and researchers develop technologies designed to improve environmental quality, support international nonproliferation, dispose of legacy wastes, and provide clean energy sources.

WSRC is responsible for transferring technologies to the private sector so that these technologies may have the collateral benefit of enhancing U.S. economic competitiveness.

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