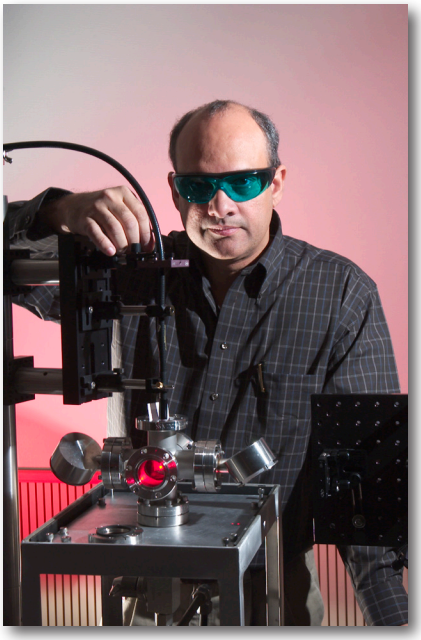
SRNL
SAVANNAH RIVER NATIONAL LABORATORY
TM

Factsheet

Sensor Development



Dr. Eliel Villa-Aleman's projects have included one of the world's largest acousto-optic tunable filter for infrared imaging, open-path Fourier transform infrared spectrometer air monitoring programs, and the development of specialized sensors.

Overview

Savannah River National Laboratory (SRNL) scientists have developed and applied variations of probes and sensors that can measure or detect chemicals in many different environments, such as industrial process streams, groundwater, and well water.

Obtaining sensitive measurements in the hostile environments common to the nuclear industry requires considerable scientific and engineering talent. SRNL excels in modifying available instruments to particular situations and in building robust systems that will operate in harsh conditions or environments for years.

Fiber-Optic Sensors

Fiber-optic sensors are ideal for hazardous environments where electrical measurements are not feasible. SRNL's versatile sensor systems have been used to measure various chemical concentrations and physical properties, including moisture, ammonia, hydrogen, pressure, and temperature. This technology tracks chemical concentrations over time and eliminates the need to gather samples manually for lab analysis, reducing analysis time, cost, and potential worker exposure.

Remote Chemical Analysis

Some process chemical measurements require laboratory-grade instrumentation. SRNL scientists are experts at hardening equipment for use in these environments and developing calibrations suitable to the unique conditions found at SRS. Analytical techniques currently used at SRS in this manner include optical absorption and Raman spectroscopy, mass spectroscopy, and gas chromatography.

Sol-Gel Indicator Sensors

SRNL scientists have developed and patented a new class of composite materials called Sol-Gel Indicators that involve encapsulation of chemical indicators into a sol-gel, silica-based glass matrix. Systems can be developed to monitor conditions such as groundwater pH, and detect species such as U or Cr. These sol-gel glass composites have been deposited onto lens and fiber optic systems, and interfaced with multiplexers and portable diode array spectrometers to conduct measurements in the field. Sensor systems, based on additional sol-gel composites, are being developed for measurements of radiation effects and for various types of medical probes.

Remote Robotic Sensor Systems

SRNL has developed the capability to take measurements in remote environments by pairing the appropriate sensor with remotely-operated,

U.S. DEPARTMENT OF ENERGY

Sensor Development

self-propelled submersible vehicles or underground boring and water monitoring equipment. These chemical and isotopic analytic capabilities can be combined with an SRNL weather information system to provide emergency response information, meteorological transport data, and dose assessments for radioactivity and hazardous waste releases. When greater sensitivity is required, high performance analytical instruments developed by SRNL can make chemical and isotopic analyses at the level of less than one-quadrillionth of a gram.

Environmental Sensors

SRNL has a history of providing rugged, field-tested instrumentation for terrestrial, aquatic, and atmospheric sampling. These instruments are designed for emergency response, radionuclide and chemical contamination measurements, aerial radiation surveys, effluent characterization, and radioactive plume measurements.

Custom Sensors

SRNL produces world-class custom instruments for sensitive specialty measurements. SRNL custom-built calorimeters are unsurpassed for accurate measurement of heat-producing materials such as tritium and plutonium. SRNL's coherent optical measurement laboratory uses non-destructive, laser-based methods to measure microscopic dimensions, pressures in sealed containers, and residual stress in materials.

Thin film sensor development is an area of specialty for Dr. Scott McWhorter. The sensors are used in gas and aqueous phase sensing of ammonia, moisture, and hydrogen to support both tritium and environmental operations.

SRNL's R&D 100 Award-winning optical temperature sensor system measures temperatures from -200° to 600°C safely and accurately even in extremely hazardous, corrosive, and high electromagnetic field environments.

Contact

Steve Wach
803-725-3020
steve.wach@srnl.doe.gov

Savannah River National Laboratory,
Bldg. 773-41A
Aiken, SC 29808

srnl.doe.gov

JANUARY 2009

We Put Science To Work™

SRNL is managed and operated for the U.S. Department of Energy by Savannah River Nuclear Solutions, LLC