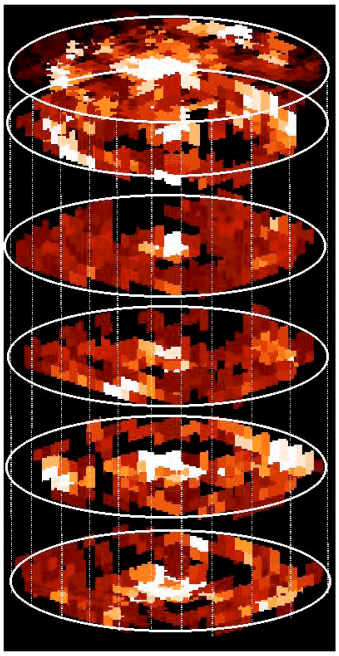
Sandia National Laboratories

Sandia Tomography and Radionuclide Transport Laboratory

Description

A need exists for characterizing, monitoring, and visualizing radionuclide transport in fractured porous media. The Sandia Tomography and Radionuclide Transport (START) Laboratory addresses transport of radioactive and hazardous materials in the geosphere. Approaches offered are on the scale and at the level of detail appropriate to the application. They range from laboratory analysis of sorption processes and dissolved chemical species, to bulk transport of mixtures of radioactive and hazardous elements in a large-scale testing apparatus. Experimental and modeling capabilities within the START Lab are oriented toward:

- Colloid-facilitated radionuclide transport
- Radionuclide and hazardous chemical transport through saturated or unsaturated rock cores and soil
- Solubility of limited concentrations of actinides in brines
- Analysis of brine flow in low-permeability materials
- Modeling of multicomponent solute transport with coupled reaction-transport computer codes



3-D Image of ^{22}Na movement through fractured microcrystalline dolomite.

Experimental Capabilities

Laboratory for working with radionuclide materials

- Large-capacity triaxial flow-through system for radioactive materials, chemical tracers, and chemical analyses
- Gloveboxes for radioactive and hazardous materials controlled atmosphere studies
- Automated pumping, sampling, and test monitoring
- Test durations of 1 day to 1 year
- Large core leaching system with gamma emission tomography

Radioanalytical capabilities

- **Quantification of Alpha Emitters** - Low-level liquid scintillation counting with sample changer, alpha spectroscopy with sample changer
- **Quantification of Beta Emitters** - Low-level liquid scintillation counting with sample changer
- **Quantification of Gamma Emitters** - NaI gamma spectroscopy system, intrinsic germanium gamma spectroscopy system with sample changer for liquid and solid samples

Tomographic imaging of radionuclide transport

- Emission and transmission images on *in situ* gamma emitting isotopes

Chemical analysis capabilities

- Flame and graphite furnace atomic absorption
- Mass spectrometry
- Gas chromatography

Radioactive microscopy capabilities

- Scanning electron microscopy with EDS
- Transmission electron microscopy
- Light microscopy - sample preparation, thin section, and polished section preparation

Autoradiography

- Large and small sample sectioning capabilities

Large-capacity triaxial flow-through system for hazardous contaminants.

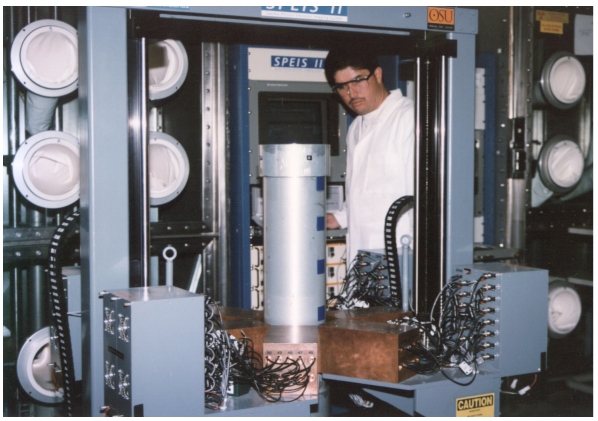
Example Projects

Column Flow Retardation Experiments

These experiments determine the radionuclide retardation in Culebra dolomite above the WIPP repository using custom-built triaxial flow and gamma spectroscopy systems to directly measure retardation in 5.7" diameter cores. Computer-aided gamma emission tomography quantifies preferential flow and solute diffusion for fractures into dolomite matrix.

Colloid-Facilitated Radionuclide Transport

The START laboratory characterizes natural colloids, colloids produced by waste degradation, and radiocolloids; development of a model to describe the formation, stability, and transport of colloids in high-ionic strength brines associated with the WIPP repository and the overlying Culebra dolomite.



64-detector computer-aided gamma emission tomography system for large-scale apparatus.

Contact

Daniel A. Lucero
NWM Program Technical Staff
Sandia National Laboratories
P.O. Box 5800, MS 0733
Albuquerque, New Mexico 87185

Phone: (505) 845-3025
Fax: (505) 284-4023
Email: dalucer@sandia.gov

Sandia National Laboratories