

ENVIRONMENT & ENERGY / ENVIRONMENTAL REMEDIATION

PROJECT: Environmental Remediation Science & Technology: *Experimental Support for Field Lysimeter Testing at the Hanford Site IDF*

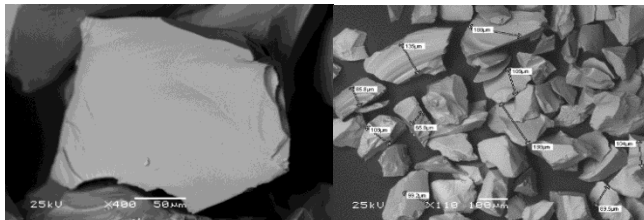
CLIENT: U.S. Department of Energy
PRINCIPAL INVESTIGATOR: Dr. Leonel Lagos
LOCATION: Richland, Washington

Description:

FIU's Applied Research Center (ARC) is providing experimental support to Pacific Northwest National Lab's (PNNL's) performance assessment calculations for storage of immobilized low activity waste (ILAW) at the U.S. Department of Energy's Hanford Site.

The Hanford Field Lysimeter Test Facility (FLTF), located in the 200 West Area of the Hanford site, is currently home to a 10-year-old field lysimeter test initiated by PNNL in 2009. This experiment will aid in validation of model predictions of long-term waste form behavior upon disposal in Hanford's Integrated Disposal Facility (IDF) (PNNL-27394).

This test will improve on the experimental design of the previous long-term lysimeter test, performed from 2002-2009 (PNNL-13670, PNNL-21812) through the investigation of multiple glass waste forms, as well as the inclusion of cementitious (grout) waste forms. One of the lysimeter configurations described in the Implementation Plan (PNNL-27394) places cementitious waste above the glass waste to understand how grout-contacted water that has been buffered through sediment can affect glass dissolution.



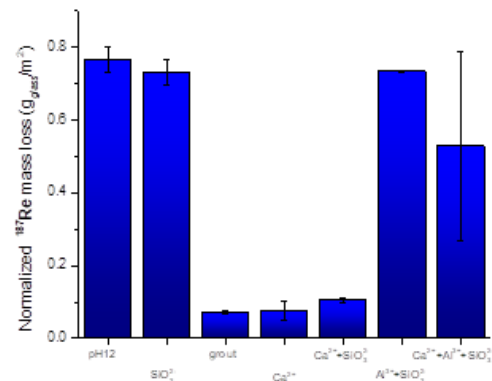
Benefits:

The experimental support provided by this collaborative project between PNNL and the Applied Research Center at FIU will enhance the design of

future FTLF units and performance assessment calculations.

Accomplishments:

- FIU studied the behavior of borosilicate glass corrosion in grout-contacted solutions and solutions that varied the presence of dissolved cementitious species (Si, Ca, Al, Na, and K) using a combination of single pass flow-through (SPFT, ASTM C1662-18) tests and a static leach test, the product consistency test (PCT, ASTM C1285-18).
- FIU investigated the effect of pH (9-12) and temperature (25°C, 40°C, 70°C) on glass dissolution behavior in the presence and absence of sediment-contacted grout solution. The glass being studied, ORLEC28, is a borosilicate glass provided by PNNL.
- FIU calculated normalized dissolution rates with respect to Re and B as a function of temperature performed in different leaching solutions at pH 12 buffer, grout-contacted, pH 12 buffer amended with 5 mg/L Si (0.18 Mm), and pH 12 buffer amended with 130 mg/L of Ca (3.24 Mm).
- FIU measured concentration profiles of major elements as a function of a distance from the edge of a glass coupon obtained by EDS cross sections after PCT in variable alkaline aqueous solutions.
- FIU determined that the grout-contacted and Ca-amended leach solutions showed lower dissolution rates, alteration layer thickness, and surface area of corroded glass compared to solutions at the same pH with and without amendments with Si and Al.



ABOUT

Since 1995, the Applied Research Center (ARC) at Florida International University (FIU) has provided critical support to the Department of Energy's Office of Environmental Management (DOE-EM) mission of accelerated risk reduction and cleanup of the environmental legacy of the nation's nuclear weapons program. ARC's applied research is performed under the DOE-FIU Cooperative Agreement (under Contract # DE-EM0000598) and provides technical support to DOE EM in the area of environmental remediation and STEM workforce development and training.

Project Contact:
Dr. Yelena Katsenovich
Ph: (305) 348-2338
Email: katsenov@fiu.edu
10555 W. Flagler Street, EC 2100
Miami, FL 33174
arc.fiu.edu