Investigation of the Properties of Acid-Contaminated Sediment and its Effect on Contaminant Mobility

by Awmna K. Rana | Vasileios Anagnostopoulos | Yelena Katsenovich

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Awmna K. Rana[1], Vasileios Anagnostopoulos[1], and Yelena Katesonovich[1]

[1] *Applied Research Center Florida International University, Miami, FL*

Mentor: Vasileios Anagnostopoulos

The Savannah River Site (SRS), is a hazardous waste management facility responsible for nuclear storage and remediation of contaminated soil and groundwater. Underground vitrified clay pipes were used to transport acid radioactive effluents to the basins and allowed to evaporate and seep into the underlying soil. Over time the acidic nature of the basin influent caused mobilization of metals and radionuclides resulting in localized groundwater contaminant plumes. The main objective of this study is to assess the impact of prolonged contact between soil and the acidic waste stream and more specifically, the change in specific surface area and pore distribution of the soil. These parameters are known to affect a substrate's ability to retain metals. Batch kinetic experiments were conducted by bringing in contact soil samples from the SRS F/H Area with nitric acid, pH 2.5, in polypropylene vials. Every day an aliquot was isolated from the supernatant, diluted 1:10 with 1% nitric acid and analysis for Al, Si and Fe was performed by means of Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES). These elements can be traced back to soil's composition of kaolinite and goethite. Preliminary results indicate that the concentration of Al, Fe and Si in the supernatant as a function of time follows an identical pattern: the concentration gradually increases up to 11 ppm for Al and Si and 7 ppm for Fe. Al and Si concentrations were higher since kaolinite is present in the soil in higher concentrations than goethite. Future work will include the determination of the specific surface area and pore distribution of soil isolated at different time intervals. These properties will be correlated to the soil's capacity to retain U(VI) during sorption experiments.

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