Demonstration of the Aging Effects of Sorbed Plutonium Complexes on Savannah River Site Sediments

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Objectives

To demonstrate changes in freshly sorbed plutonium versus aged plutonium complexes.

Experimetal Methods

Batch Desorption Experiments

Description of Kd's evaluated by batch desorption experiments over 7 and 28 days in the presence of different ligands. All Kd values measured for 32 years and 20% for 3 days. Kd values compared with those measured previously at the Savannah River Site for plutonium aged for 32 years.

Sample Conditions

- Solutions for 239/240Pu at 6 µg/g aged for 32 years and 242Pu at 0.06 µg/g aged for 32 years.
- 5 mL total volume.
- 3% Pu(V)O4 added as a method recovery marker.

Alpha Spectroscopy

α-particle spectroscopy confirmed that the alpha activity measured by LSC is not from naturally occurring isotopes of 238Pu and/or daughter products.

Summary and Implications

- Kil values were not statistically different for desorption of different ligands and different concentrations after plutonium complexes had aged for 32 years on SRS sediments.
- Kil values were not correlated to changes in concentration of ligands.
- Kil values were not significantly different for desorption over 7 days versus 28 days after plutonium complexes had aged for 32 years in SRS sediments.

Desorption Kd's evaluated by batch desorption experiments over 7 and 28 days in the presence of various iron fractions. Kd values measured for 32 years and 20% for 3 days.

Selective Iron Extractions

Selective iron extractions were performed following a 3-day autoionization reaction (239/240Pu) and desorption (239/240Pu) experiment. Samples were prepared in dupliate with one of each for the highest concentration of each ligand. Measurements were made with one being analyzed for total iron and one for atomic iron.

Contribution and contribution for determination of aqueous fraction of plutonium (<430 nm, 180 nm, and distilled).