Supporting Information

Impact of Environmental Curium on Plutonium Migration and Isotopic Signatures

Hiromu Kurosaki[1], Daniel I. Kaplan[2], and Sue B. Clark[1]

[1]Washington State University, Department of Chemistry, P.O. Box 644630, Pullman, WA, 99164-4630

[2]Savannah River National Laboratory, Aiken, SC, 29808

3 Pages, 2 Tables

Table S1. Comparison of Two Sampling Locations.

	INL SDA	SRS F-Area
Waste type	Solid waste	Liquid waste
Disposal type	Unlined landfill	Unlined basin
Disposal period	1952 ~ 1970	1955 ~ 1988
Area climate	Dry	Wet
Likely mode of transport	Wind, flooding	Groundwater Flow
Sample collection area	Vicinity of SDA	Basin, Downgradient Wells
Sample collection depth	0 ~ 4 cm	15 ~ 20 m
Relevant for this study	$^{239, 240, 241}$Pu, ^{241}Am	^{239}Pu, ^{241}Am, ^{244}Cm

Alpha Spectrometry. Alpha activities were measured using an ORTEC OCTETE Plus alpha spectrometry system (ORTEC, Oak Ridge, TN). Most samples were counted for three to five days, depending on the activity level. The alpha peaks used to determine activities were 5485 keV for ^{241}Am, 5805 keV for ^{244}Cm, 5499 keV for ^{238}Pu, 5157 keV for ^{239}Pu, 5168 keV for ^{240}Pu. Since ^{239}Pu and ^{240}Pu cannot be resolved by alpha spectrometry, their activities are reported as combined $^{239+240}$Pu activity. Background activities were determined by counting for a few months; this activity was subtracted from each spectrum to determine the final activity values.

ICP-MS. After alpha spectrometry measurements of the Pu samples, the filters were dissolved with concentrated nitric acid and perchloric acid on a hot plate. This solution was then re-constituted with 1 mL of 2% nitric acid for ICP-MS analysis. Plutonium isotopic ratios were measured using a Thermo Finnigan Element 2 sector field ICP-MS (Thermo Electron Corp., Bremen, Germany). The solution was introduced to the system using a 100 μL / min PFA microflow nebulizer (Elemental Scientific, Inc.; Table S2). Abundance of each isotope was measured by monitoring the channels in the mass range of 235 through 242. For each isotope, counts were monitored for 10 readings and the average was recorded. The tubing was washed with 2 M nitric acid for 60 sec between samples.

Table S2. Mass Spectrometric Parameters.

Plasma power	1250 W
Nebulizer gas flow rate	1.05 L / min
Auxiliary gas flow	1 L / min
Plasma gas flow	16 L / min
Interface cones	Ni
Monitored Masses	235, 238, 239, 240, 241, 242
Dwell time	0.01
Number of point per peak	10
Detector dead time	19 ns
Number of passes	10
Number of runs	10
Resolution setting	Low (resolution ~ 300)