

RADIOCHEMISTRY OF ACTINIDES IN HIGH CONCENTRATION BRINE SOLUTIONS

Amy S. Wong and Nelson D. Stalnaker

Chemical Science and Technology Division
Los Alamos National Laboratory, MS G740
Los Alamos, NM 87545

Radiochemical analysis, inductively coupled plasma-mass spectrometry (ICP-MS), and various other analysis of actinides in high concentration brine solutions for the Waste Isolation Pilot Plant (WIPP) Actinide Source-Term Waste Test Program (STTP) are currently being carried out at Los Alamos National Laboratory.

Beginning April 1995, samples of brine solutions have been collected from 15 drum-scale, 33 liter-scale, and 6 pressurized liter-scale test containers. This is an on-going project which involves massive amount of work and efforts from multiple groups and divisions (Chemical Science and Technology, CST, and Material Science and Technology, MST) at LANL. TRU wastes (combustibles, metals, lab waste) taken from the LANL waste inventory were loaded into drum-scale test containers, filled with synthetic brine solutions, and spiked with different influencing variables (iron mesh, chelators, and Th/U/Np/Am spikes). Liter-scale test containers were loaded with sludges, cemented or solidified wastes, or pyrochemical salts at different liquid to solid ratios.

Brine samples were withdrawn from the test containers on a periodic schedule. Each brine sample is sequentially filtered through a 1 μm filter (coarse) and then a 0.2 μm filter (fine). The samples from unfiltered, coarse-filtered, and fine-filtered brine solutions are analyzed for the total alpha activity and ^{241}Am concentration by liquid scintillation counting and gamma-ray spectrometry respectively. The other actinides (Np, U, and Th) in the fine-filtered brine solutions are analyzed by ICP-MS, and the elemental compositions are determined by ICP-AES (atomic emission spectrometry) and graphite furnace atomic absorption spectrometry. Anions, pH, Eh, total inorganic and organic carbons are also performed on the fine-filtered sample. Filters from the filtration are analyzed for the elemental composition by wavelength dispersive X-ray fluorescence (WDXRF), for the particle-size distribution, and for characterizing possible colloids formation. In addition, headspace gas samples from the drum- and liter-scale test containers are routinely analyzed for N_2 , O_2 , H_2 , CO_2 , N_2O , and CH_4 by gas chromatography to establish the relative ratio of generated gases. All work is controlled by QA/QC procedures, and results are compiled into a data package.

In this talk, an overview of STTP will be presented. The preliminary results of actinides in high concentration brine solutions from the radiochemistry and ICP-MS will be discussed.