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The Measurement of Actinides by Accelerator Mass Spectrometry

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We developed a simple method to separate Pu and Am isotopes from the sample matrix using a single extraction chromatography column and to measure the concentrations of the isotopes by isotope dilution accelerator mass spectrometry (AMS). Pu and Am in the extraction chromatography column eluent were coprecipitated with NdF₃ or Fe(OH)₃ and the precipitates were analyzed by AMS at the University of Ottawa, A.E. Lalonde AMS Laboratory. The advantages of each precipitation method were assessed by studying the sensitivity, detection limits, and precision of the Am and Pu isotope measurements. The strongest AMS beams of Pu and Am were produced when there was a large excess of fluoride donor atoms in the target and the NdF₃ precipitates were diluted with PbF₂. The measured concentrations of Pu-239,240 and Am-241 agreed with the concentrations in standards of known activity and with IAEA certified reference materials. This work demonstrated that both oxide and fluoride targets produce reliable beams of actinide anions and that the measurement of actinides using fluorides agrees with measurements made using oxide precipitates and with the values in certified reference materials.

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