Designation: C1414 – 01 (Reapproved 2014)

Standard Practice for The Separation of Americium from Plutonium by Ion Exchange[1]

This standard is issued under the fixed designation C1414; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice describes the use of an ion exchange technique to separate plutonium from solutions containing low concentrations of americium prior to measurement of the ^{241}Am by gamma counting.

1.2 This practice covers the removal of plutonium, but not all the other radioactive isotopes that may interfere in the determination of ^{241}Am.

1.3 This practice can be used when ^{241}Am is to be determined in samples in which the plutonium is in the form of metal, oxide, or other solid provided that the solid is appropriately sampled and dissolved (See Test Methods C758, C759, and C1168).

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C758 Test Methods for Chemical, Mass Spectrometric, Spectrochemical, Nuclear, and Radiochemical Analysis of Nuclear-Grade Plutonium Metal

C759 Test Methods for Chemical, Mass Spectrometric, Spectrochemical, Nuclear, and Radiochemical Analysis of Nuclear-Grade Plutonium Nitrate Solutions

C1168 Practice for Preparation and Dissolution of Plutonium Materials for Analysis

C1268 Test Method for Quantitative Determination of Americium 241 in Plutonium by Gamma-Ray Spectrometry

D1193 Specification for Reagent Water

3. Summary of Practice

3.1 Plutonium is adsorbed from a nitric acid (HNO_3) solution (8 *M*) onto an anion exchange resin. Under these conditions, a negligible amount of americium is adsorbed onto the resin and may be determined by gamma counting of the eluate using Test Method C1268.

4. Significance and Use

4.1 This practice is applicable when small amounts of ^{241}Am are present in plutonium samples (see Test Methods C758 and C759). An example is the determination of ^{241}Am in a ^{238}Pu sample. The high specific activity of ^{238}Pu presents a safety hazard that precludes its presence in a counting facility. Therefore, it is necessary to remove the ^{238}Pu prior to the determination of ^{241}Am.

4.2 When a plutonium solution contains fission or activation products, this practice does not separate all radionuclides that interfere in the determination of ^{241}Am, such as the rare earths.

5. Interferences

5.1 The presence of other gamma-ray emitting radionuclides similar in energy to ^{241}Am or that interfere with gamma counting make the determination of ^{241}Am less accurate. Most +4 valence actinides are adsorbed on the resin. The distribution coefficient for Am on this resin in nitric acid is less than 1, indicating insignificant adsorption. Therefore, this practice will separate many elements that might interfere with gamma counting of ^{241}Am.

5.1.1 The elements thorium, neptunium (IV), gold, platinum, iridium, and palladium are not quantitatively separated from plutonium by this procedure.

6. Apparatus

6.1 *Anion exchange resin column* (100-200 mesh), containing quaternary ammonium functional groups (basic resin-chloride ionic form).[3]

6.2 *Bottles,* polyethylene, 30 mL.

6.3 *Sample beaker,* 30 mL, borosilicate glass.

[1] This practice is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.05 on Methods of Test.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Prefilled columns packed with AG 1-X8, available from Bio-Rad, Richmond, CA, have been found to be acceptable.