USTUR 310: SEPARATION AND PURIFICATION OF AMERICIUM FROM PRE-CONCENTRATED TISSUE SOLUTIONS

Purpose	Separation and purification of Americium from pre-concentrated tissue solutions	**Method Number**	USTUR 310
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SAFETY NOTE: Before beginning this procedure read all of the Material Safety Data Sheets for the chemicals listed in Section 5 of this procedure.

1. Principle of Method

1.1. The americium portion of the sample, previously separated from plutonium in USTUR 220, is separated and purified by extraction chromatography from any remaining radionuclides or interfering elements.

1.2. The final americium aliquot is wet-ashed with sulfuric acid to remove traces of organic material from the extraction resin and then prepared for electrodeposition following procedure USTUR 510.

2. Minimum Detectable Activity (MDA)

2.1. MDA is limited by the counter background.

2.2 For routine measurements with a 75,000-s counting period, a tracer recovery of 60%, and a counting efficiency of 25%, L_d is 8E-4 Bq per sample (0.05 dpm) of ^{241}Am.

3. Accuracy and Precision

3.1. Average blank recovery of ^{243}Am tracer is equal to 76% ± 16% at the 0.16-Bq (10 dpm) activity level.

4. Apparatus

4.1. Hotplate.

4.2. Hotplate thermometer with range to 200ºC.

4.3. Eichrom TRU resin column.

4.4. Bio-Rad plastic column reservoir.

4.5. Rack: to support columns.

4.6. Beakers: various sizes.

4.7. Watchglasses: assorted sizes to fit beakers.

4.8. Graduated cylinders: various sizes.

4.9. Disposable plastic transfer pipet.

5. Reagents

5.1. 18 M Ω Type 1 deionized water (D.I. water).

5.2. Nitric acid (concentrated 69-71%, reagent-grade).

5.3. Nitric acid (3 M). Add 190 mL of concentrated HNO_3 to 810 mL of Type 1 deionized water.

5.4. Nitric acid (0.025 M). Add 1 mL of concentrated HNO_3 to Type 1 deionized water and bring to a volume of 640 mL with Type 1 deionized water.

5.5. Sulfuric acid (concentrated 96-98%, reagent grade).

6. Procedure

6.1. Sample preparation.

6.1.1. Americium aliquot from step 6.3.8, USTUR 220, is run in this procedure.

6.2. Sample dissolution.

6.2.1. To each dried americium aliquot, add 25 mL of 3 M HNO_3.

6.2.2. Cover each sample with a watchglass and warm on hotplate set at 120ºC to completely dissolve the sample. Remove from hotplate and cool completely before adding solution to column.

6.3. Extraction Separation.

6.3.1. Remove the cap from a TRU column and fit a Bio-Rad reservoir onto its top.

Note: Column resin should be covered with several milliliters of liquid, if the column is dry do not use it.

6.3.2. Snap bottom tip from column and allow storage solution to drain.

6.3.3. When the column has drained, add 8 mL of 3 M HNO_3 and allow it to drain completely.

6.3.4. Add the prepared sample solution to the column; rinse the beaker twice with approximately 5 mL of 3 M HNO_3 and adding each rinse to the column. Allow the column to drain completely.

6.3.5. Add 12 mL of 3 M HNO_3 to the column and allow it to drain completely.

6.3.6. Using a disposable pipet, collect any remaining droplets left in the column top and reservoir and add to column. Allow the column to drain completely.

6.3.7. Place a clean 100 or 150 mL beaker, labeled with sample number and "Am", under the column.

6.3.8. Add 15 mL of 0.025 M HNO_3 to the column to remove americium. Allow it to drain completely.

6.3.9. Add 2 mL of concentrated sulfuric acid to the sample in the collection beaker.

6.3.10. Bring the sample to dryness by starting on a hotplate set at 120ºC and gradually raising the temperature up to 250ºC, until the sulfuric acid is fumed off.

6.3.11. Continue preparing the sample for electrodeposition by following USTUR 510.

Note: Add 4 mL instead of 2 mL of 0.36 M $NaHSO_4$ to sample for optimum recovery and proceed to USTUR 510.

7. Source Materials

7.1. Hongguo Qu, et al, J. Radioanalytical and Nuclear Chem. 234 (1-2), 175 (1998).