

UNITED STATES TRANSURANIUM AND URANIUM REGISTRIES
ANALYTICAL PROCEDURE MANUAL

USTUR 140: SAMPLE ALIQUOT SELECTION FOR RADIOCHEMICAL ANALYSIS

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| Purpose | Sample Aliquot Selection for Radiochemical Analysis | Method Number | USTUR 140 |
| Original Date | 10/10/95 | Revisions By | Radiochemistry Staff |
| Revision Number | 2 | Approved By | James T. Elliston |
| Effective Date | 2/11/03 | Approval Date | 2/11/03 |

SAFETY NOTE: Before beginning this procedure, read all of the Material Safety Data Sheets for the chemicals listed in Section 3 of this procedure.

1. Principle of Method

- 1.1. An aliquot of solution is taken, and tracer isotopes are added.

2. Apparatus

- 2.1. Beakers: borosilicate glass, 150 to 250 mL.
- 2.2. Balance: with at least two-decimal-place accuracy.
- 2.3. Watch glasses: ribbed in sizes to fit beakers in use.
- 2.4. Fume hood.
- 2.5. Hot plates: adjustable to 140° C.
- 2.6. Pipettor, adjustable.
- 2.7. Pipette tips to fit pipettor.

3. Reagents

- 3.1. 18 M Ω (nanopure) deionized water.
- 3.2. Hydrochloric acid (concentrated, 36.5-38%, reagent-grade).
- 3.3. Hydrochloric acid (8 M). Add 667 mL of concentrated HCl to 300 mL nanopure H₂O. Dilute to 1000 mL with nanopure H₂O.
- 3.4. Plutonium-242 tracer solution.
- 3.5. Americium-243 tracer solution.

UNITED STATES TRANSURANIUM AND URANIUM REGISTRIES
ANALYTICAL PROCEDURE MANUAL

- 3.6. Uranium-232 tracer solution.
- 3.7. Thorium-229 tracer solution.
- 3.8. Quality control solutions. Make solutions of the appropriate isotope(s), bring the total solution weight to 1000g. The concentration of each isotope should be approximately 0.5 dpm per 50g. (The value is accurately known.) Use 6-8 M HCl to make up the solution. Use Pu-238 and Am-241 for the Pu/Am quality control solution, natural U for the uranium solution, and thorium nitrate for the thorium solution.

4. Sample Aliquot Selection for Radiochemical Analysis

- 4.1. Determine the sample aliquot volume required to detect the analyte of interest from the estimated gross concentration of alpha activity and ash weight of the tissue.
- 4.2. Tare the beaker selected to contain the aliquot volume and transfer an appropriate aliquot. Record the sample weight.
- 4.3. For each batch of samples being run, weigh an aliquot of the appropriate quality control solution into separate beaker.
- 4.4. Add tracers. Make an appropriate blank, adding 75 mL of 6-8 M HCl into a separate beaker.
 - 4.4.1. NOTE: If very large sample aliquots are taken for uranium analysis, larger amounts of HCl should be added to the blank.
- 4.5. Add appropriate tracers to aliquot.
 - 4.5.1. CAUTION: Some tracers contain isotopes which may interfere with analysis depending on the methods used.
- 4.6. Place the sample beaker on a hot plate with a surface temperature of 120°C-140°C. Take the sample to dryness. Do not bake. Allow the sample to cool.
- 4.7. Proceed to appropriate procedure for isolation from prepared tissue solutions.

5. Source Material

- 5.1. H. A. Boyd, B. C. Eutsler, and J.F. McInroy, "Determination of Americium and Plutonium in Autopsy Tissue: Methods and Problems," in Actinides in Man and Animals, Proceedings of the Snowbird Actinide Workshop, Oct 15-17, 1979, M. E. Wrenn, scientific editor (R. D. Press, Salt Lake City, Utah, 1981), pp. 43-52.
- 5.2. LANL Procedures manual. RESL Procedure. Claude Sill's Method.

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