USTUR 630: PREPARATION OF SECONDARY SOURCES

Purpose	Prepare secondary alpha sources for energy and efficiency calibration for alpha spectrometry	**Method Number**	USTUR 630
Original Date	10/10/95	**Author**	USTUR Radiochemistry Staff
Revision Number	2	**Approved** by	Jim Elliston
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1. Principle of Method

1.1. Multi-isotopic secondary sources are prepared by electrodeposition according to USTUR 500 with approximately 600 dpm of each radionuclide.

1.2. Detectors are calibrated with a National Institute for Standards and Technology (NIST) traceable source at the greatest source-to-detector distance achievable to minimize geometry differences between the NIST and secondary sources to be measured.

1.3. The isotopic activity of the secondary sources is measured in the same geometry as the NIST source (including the backing material on the NIST source).

1.4. Secondary sources are then used to efficiency- and energy-calibrate the alpha spectrometry system in the standard counting geometry (second shelf).

2. Apparatus

2.1. 50 mL beaker

2.2. Hot plate

2.3. As required by USTUR 500 for electrodeposition

2.4. As required by USTUR 660 for alpha spectrometry

3. Reagents

3.1. ^{242}Pu solution (~1000 dpm/mL)

3.2. ^{239}Pu solution (~1000 dpm/mL)

3.3. ^{241}Am solution (~1000 dpm/mL)

3.4. National Institute for Standards and Technology (NIST) traceable alpha emitting source (^{238}Pu)

3.5. Nitric acid (concentrated)

4. Secondary Source Preparation

4.1. Preparation of Source

4.1.1. Add approximately 600 dpm of ^{239}Pu, ^{242}Pu, and ^{241}Am to a 50 mL beaker. Add 10 mL of concentrated nitric acid and take to dryness on a hot plate.

4.1.2. Electroplate the source according to USTUR 500, "Electroplating Americium, Plutonium, Thorium, and Uranium" or USTUR 510.

5. Calibration of Alpha Spectroscopy System for NIST Source

5.1. Place a NIST traceable alpha emitting source on the lowest shelf of the alpha spectrometry chamber to be calibrated for determination of the secondary source isotopic activities.

5.2. Count the source for the appropriate radionuclides for 75,000 seconds (or other appropriate count time) and efficiency calibrate the chamber according to USTUR 620, Routine Energy Calibration, Efficiency Calibration, and Background Counts.

6. Secondary Source Evaluation

6.1. Count the secondary source for the appropriate isotopes in the same geometry as the NIST source according to USTUR 660, Alpha Spectrometry Acquisition Procedure for Absolute Analysis. Count the source for 75,000 seconds.

6.2. Evaluate the secondary source for appropriate isotopic activity (at least 300 dpm per isotope) and resolution (< 50 keV full width half-maximum (FWHM)).

6.3. Sources which are acceptable may be used as secondary sources for routine energy and efficiency calibration of the alpha spectrometry system.

6.4. Sources which are not acceptable shall be disposed of according to appropriate radiation safety guidelines.