

UNITED STATES TRANSURANIUM AND URANIUM REGISTRIES
ANALYTICAL PROCEDURE MANUAL

**USTUR 650: ALPHA SPECTROMETRY ACQUISITION PROCEDURE FOR
ABSOLUTE AND RELATIVE ANALYSIS**

Purpose	Relative analysis for α -spectrometry	Method Number	USTUR 650
Original Date	10/10/95	Author	USTUR Radiochemistry Staff
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WARNING: Personnel must be aware of proper handling procedures for radioactive sources and proper usage of the alpha spectrometry equipment. Misuse can result in costly damage to equipment.

SOFTWARE: MAESTRO™ for Windows Version 5.0 ALPHAVISION Version 4.02

1. Principle of Method

- 1.1 Relative analysis is used for the spectrometric evaluation of alpha emitting radionuclides.
- 1.2 Most radiochemical analyses of USTUR samples require correction for losses during chemical separation and are therefore analyzed by USTUR 650.
- 1.3 Ultra detectors are not as sensitive to rapid changes in vacuum as standard surface barrier detectors. However, when using standard surface barrier detectors, operation above 500 mtorr will result in destruction of that detector.

2. Procedures Conducted Prior to RELATIVE Analysis

- 2.1 Each chamber to be used for analysis of samples must first have a valid energy, efficiency calibration, and background count.
- 2.2 The energy calibration and background count are conducted monthly, while efficiency calibration is conducted yearly or as needed.
- 2.3 See USTUR 610 for further details on system setup.
- 2.4 See USTUR 620 for energy calibration, efficiency calibration, and background counting methods.
- 2.5 See USTUR 600 for further descriptions of alpha spectrometric analysis.

3. Relative Analysis Procedures

- 3.1 Enter ALPHAVISION™ (Figure 1) and note all chambers which are actively counting. The color of the α symbol denotes status: green is cleared, blue is idle, and yellow for active.
- 3.2 Open the appropriate chamber(s), remove and/or insert sample(s) on the appropriate shelf and close the chamber door(s). If the time period between sample insertion and vacuum application is expected to be greater than 5 minutes return the active chamber(s) vacuum from HOLD to PUMP, to insure that the active chambers do not exceed 100 mtorr. The active chamber(s) **must** be returned to the HOLD position prior to applying vacuum to **any** chambers which had been opened to atmospheric pressure.
- 3.3 To restart vacuum make sure **ALL** active chamber(s) vacuum are on HOLD, switch the appropriate, inactive, chamber(s) from VENT to PUMP. When chamber pressures are < 100 mtorr turn on the Bias Voltage and then switch **all active chambers** from HOLD to PUMP. Reopen vacuum control unit if necessary. For MCB's 3, 4, and 5 the pressure gauge on top of the assembly should read < 50 torr due to voltage suppression.
- 3.4 For a single detector: In AlphaVision highlight the detector to be used for acquisition. Right click the mouse and select "View Detector". This opens the Maestro detector window. Open the "Acquire" drop down window and select "Adjust Controls". The Octète vacuum, bias voltage, current window will open. Click on the "ON" radiobutton then click on "OK". This turns the bias voltage on. The Octète window closes automatically. Close the Maestro detector window, which returns the operator to the AlphaVision format.
- 3.5 For a "Group" of detectors in AlphaVision select "Options". Under "Options" select "Octète Settings". In the "Alpha Spec MCB" window click on the down arrow and select the desired MCB group. The current status of the MCB will be displayed. Under the "Acquire" drop down window select "Adjust Controls". The status of "Octète Control" for vacuum, bias voltage, and current for all of the detectors in the MCB will be displayed. The bias voltage can be turned on individually or by group. When the appropriate bias voltages have been turned on click on OK to close the "Octète Control" window. Close the Alpha Spec MCB window, which returns the operator to the AlphaVision format.
- 3.6 Select either the individual detector or an entire MCB Group. Right click on your choice and select analysis and follow the on-screen directions, click "OK". The "General Analysis" window opens. In the "Sample Description" line enter the sample name as per the naming convention protocol, duplicate the name in the "Path" window, select the analysis protocol under sample type, confirm the tracer activity, and click on "Begin".

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- 3.6.1 If you have selected only one detector the detector will begin acquiring and at the completion of the counting period will automatically analyze the sample.
- 3.6.2 If the operator has selected an MCB Group then the next idle detector (sequentially) will be displayed in the “General Analysis” window for sample input and protocol selection until the last idle detector is used. Idle detectors can be skipped by clicking on “Cancel”. After the last detector in the MCB Group has been accessed and started or cancelled the “General Analysis” window closes and the system returns to the AlphaVision window.
- 3.7 Upon completion of counting, analyze the plot of the spectra for correct ROI’s, counting information, etc. if it is not completed automatically. Some adjustments may be required for broad peaks.
- 3.8 File report as required.
- 3.9 Examine the plot of each spectra and ensure no modifications are needed to the ROI’s.
- 3.10 If no modifications are needed, then the analysis is complete.
- 3.11 If modifications are needed to the ROI’s, re-analyze using the corrected specifications or protocol.