

Actinide/Rare Earth Separation (TEVA-SCN)

Summary of Method Am/Cm or other trivalent actinide(s) are separated from trivalent rare earth cations prior to preparation of rare earth fluoride microprecipitation sources for alpha spectrometry. Some samples (soil, rock, building materials, etc.) may have a high native content of rare earth metal ions, which cannot be adequately separated from the trivalent actinides during the normal analytical scale chromatographic separations used to purify these elements. The mass of the native rare earths can degrade the alpha spectra of the nuclides through mass self-attenuation. For these samples, an additional separation of the actinides from the rare earths using TEVA Resin in the thiocyanate (SCN) form will improve the resolution of the alpha spectra.

After purification of the Am/Cm (or other trivalent actinides) on TRU or DGA Resin, the actinide fraction is digested with $\text{HNO}_3\text{-H}_2\text{SO}_4$, evaporated to dryness, and dissolved in 4M NH_4SCN -0.1M formic acid. The sample is then loaded onto a 2 mL cartridge of TEVA resin, which retains the actinides, while the rare earth elements are not retained. The Am/Cm (or other trivalent actinide) are then recovered in 1M HCl and prepared for alpha spectrometry by rare earth fluoride microprecipitation (AN-1805).

Reagents

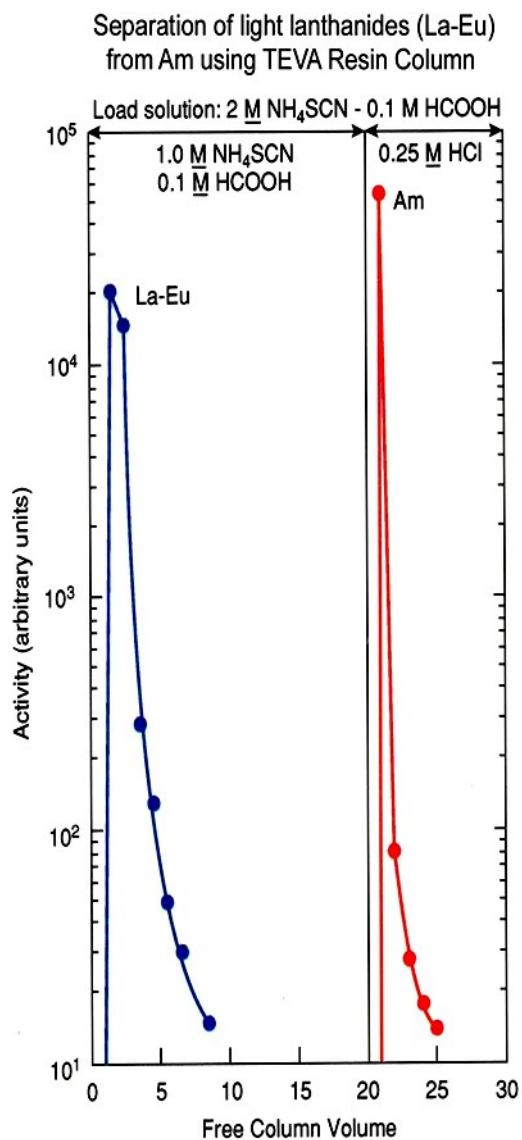
TEVA Resin, 2 mL Cartridges (Eichrom TE-R50-S)
Ammonium Thiocyanate (NH_4SCN)
Nitric Acid (70%)
Hydrochloric Acid (37%)
Sulfuric Acid (98%)
Deionized Water
Formic Acid

Equipment

Vacuum Box (Eichrom AR-24-BOX or AR-12-BOX)
Cartridge Reservoir, 20 mL (Eichrom AR-200-RV20)
Inner Support Tubes-PE (Eichrom AR-1000-TUBE-PE)
Yellow Outer Tips (Eichrom AR-1000-OT)
50 mL Centrifuge Tubes
Hot Plate
Vacuum Pump

Figure 1. Actinide/Rare Earth Separation on TEVA Resin

- (1) Add 2 mL 70% HNO_3 + 50 μL 10% H_2SO_4 to Am/Cm eluate from TRU or DGA Resin separation. Evaporate to dryness.
- (2) Ash to dryness with 3 mL 70% HNO_3 + 2 mL 30% H_2O_2 .
- (3) Dissolve Am/Cm in 5 mL 4M NH_4SCN -0.1M Formic acid.
- (4) Precondition 2 mL TEVA cartridge with 5 mL 4M NH_4SCN -0.1M Formic acid.
- (5) Load Am/Cm from step (3) on TEVA.
- (6) Rinse Am/Cm beaker with 5 mL 4M NH_4SCN -0.1M Formic acid. Add to TEVA.
- (7) Rinse TEVA w/ 10 mL 1.5M NH_4SCN -0.1M Formic acid.
- (8) Strip Am/Cm from TEVA with 20 mL 1M HCl.
- (9) Prepare alpha spectrometry source using rare earth fluoride microprecipitation (AN-1805).



References

- 1) SEPERATION OF AMERICIUM FROM RARE EARTHS, Eichrom Method SPA-03.