**Actinide Target Preparation Laboratory**

The Actinide Target Preparation Laboratory at Oregon State University is a well-equipped facility for the fabrication and assay of actinide targets for studies of fission and heavy element synthesis. The Laboratory produces about 50 actinide targets per year for use by the OSU nuclear chemistry group in their studies of heavy element production and fission as well as supplying actinide targets to national laboratory research groups. (Recent national laboratory “customers” include the Lawrence Berkeley National Laboratory (Heavy Element Group) and the Lawrence Livermore National Laboratory). The Laboratory is part of a NERI-C collaboration to provide the special targets needed for a fission TPC. Many of these targets are for use in particle accelerator experiments where target heating is an issue. Our targets have performed satisfactorily in this environment [1, 2]. During the past year, the laboratory has fabricated and shipped thin (100-500 µg/cm^2) targets of ^238^U, ^235^U, ^237^Np, ^238^Pu and ^241^Am. Over the past several years, we have also prepared thin targets of ^239^Pu, ^235^U, ^232^Th and ^226^Ra.

We use three methods for target preparation, vacuum deposition, molecular plating and electrodeposition. If sufficient material is available, we prefer to use vacuum deposition as that technique gives the most uniform targets (non-uniformity of < 10% across the target, with most areas of the target being uniform to < 2%). Our yields for vacuum deposition are 2-20%. We prepare tetrafluorides of the element of interest and volatilize the tetrafluorides using a heated boat/filament in vacuum. The vapors condense on a cold metal substrate. The substrate can be rotated to improve uniformity. We have used C, Al, Ti and Ni as substrates.

If limited amounts of actinide material are available, we prefer depositing the material on a substrate using molecular plating [3]. Small quantities of the nitrates of the actinides are dissolved in water and aliquots of these solutions (20-100µL) are placed in 2-5 mL of isopropanol or isobutanol in a plating cell. Vigorous stirring is used to achieve uniform deposits. Deposition yields of > 90% are routine on common substrates such as Be, Al, Ti or Ni. Deposits are limited to 100-200µg/cm^2 per plating operation. Following plating, the foils are flamed in air to convert the hydrous oxides to constant composition and if needed, further layers can be deposited.

Prior to target preparation, especially for shorter-lived actinides, chemical separation procedures are employed to rid the material of daughter products or other impurities.

Following target preparation, the foils are assayed. Alpha spectroscopy through pinhole collimators is used to establish target thickness and uniformity. If very precise information on uniformity is needed, we can do an AFM analysis of targets. [4]

We routinely ship packages of 1-20 targets to various laboratories. We build special evacuated plastic containers to hold the targets. Breakage of the targets is less than 10-20% of the thin targets with no material release. We usually prepare a modest excess of targets to take care of this contingency.

**References**