

Development of Frontend Processing to Allow Use of High-Density LEU Foil Targets in Current Mo-99 Production Facilities

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ABSTRACT

In order to meet the Mo-99 yields produced by high enriched uranium (HEU) fission while maintaining the scope of the Global Threat Reduction Initiative (GTRI), high-density low enriched elemental uranium (LEU) targets could offer a competitive edge. This denser fuel material (as compared to uranium-aluminide, oxide, or silicide) will allow similar or increased U-235 content in an annular foil target than the current HEU target, which would benefit the neutron economy and fission yields during irradiations.

Two frontend processes for treating irradiated LEU targets were developed and tested at Argonne. The product of these frontend processes is a solution that could be fed into current Mo-purification processes. One process investigated the ambient pressure dissolution of irradiated LEU foil with nitric acid. Following the dissolution, the acidic dissolver solution containing uranium and all activation and fission products is fed to a column containing a TiO₂ sorbent that is specific for Mo. The Mo held on the column is stripped from the column using alkaline solution, which is a perfect feed for current purification processes. In the second frontend process, LEU foils are electrochemically dissolved by anodic oxidation in a bicarbonate solution. The cationic actinides and fission products are precipitated using CaO, leaving the anionic Mo in an alkaline solution. These processes have been demonstrated using low-burnup uranium foils.