Conversion of Uranyl Sulfate Solution to Uranyl Nitrate Solution for Processing in UREX

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ABSTRACT

SHINE Medical Technologies is developing a production method for fission-product Mo-99 using a deuterium-tritium (DT) neutron generator to drive fission in a non-critical aqueous solution of low enriched uranium (LEU) in the form of uranyl sulfate solution. In their process, they have chosen to perform periodic cleanup of the uranyl sulfate target solution. Argonne has looked at alternative methods to purify and reuse the uranyl sulfate and has chosen to develop and demonstrate one that uses the UREX (uranium extraction) solvent extraction process as the most effective means to purify the LEU for recycle; however, the UREX process requires a uranyl nitrate solution as its feed. Uranyl sulfate solutions do not perform well in UREX, because uranyl sulfate is not extractable by the UREX solvent. Further, sulfate forms strong complexes with the uranyl ion that limit its extractability. Therefore, the uranyl sulfate solution must be converted to uranyl nitrate with only a minimal residual concentration of sulfate remaining in solution. This presentation will discuss the complete purification and conversion recycle of the target solution, with emphasis on the precipitation procedure developed for the conversion of the uranyl-sulfate solution to nitrate.