Column Optimization for Mo Separation and Recovery

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ABSTRACT

Argonne National Laboratory has collaborated with Purdue University to design Mo-separation and recovery columns using a titania sorbent. Purdue University's VERSE (VErsatile Reaction SEparation) simulator has been utilized to design plant-scale columns for the separation and recovery of Mo-99 from irradiated uranyl-nitrate and uranyl-sulfate solutions. Data are collected in a batch mode and small-scale column setting and input into VERSE. Column dimensions and flow rates are determined by VERSE and can continuously be optimized as more data are collected. Tracer experiments using direct downscale columns have validated the plant-scale designs. Data from the mini-SHINE (Subcritical Hybrid Intense Neutron Emitter) experiments will be input into VERSE for further optimization, as the effects of a high radiation field may change redox chemistry, speciation, and adsorption of Mo and other fission products on titania. Molybdenum-separation and recovery from a low-enriched uranium solution as nitrate or sulfate has been successfully demonstrated using a titania sorbent.