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# Development of solvent extraction scheme for reprocessing of advanced heavy water reactor spent fuel using *N,N*-Dihexyl octanamide as extractant

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**ABSTRACT**

Distribution studies on Th(IV), Pa(V), U(VI) and Pu(IV) were carried out employing tri-*n*-butyl phosphate (TBP) and *N,N*-dihexyl octanamide (DHOA) as extractants under proposed advanced heavy water reactor (AHWR) spent fuel feed conditions. DHOA was found promising for selective extraction of U/Pu over Pa and Th as compared to TBP. Both Pu and Th formed trisolvated species with DHOA at 4 M $HNO_3$. Batch solvent extraction experiments were carried out for selective extraction of U and Pu from simulated AHWR spent fuel dissolver solution using 0.36 M DHOA and 0.18 M TBP dissolved in *n*-dodecane as solvents. Quantitative extraction of uranium and plutonium was achieved under experimental conditions leaving bulk of thorium in the raffinate. The co-extracted thorium from the organic phase was proposed to be scrubbed using 4 M $HNO_3$. A series of non-salt forming reductants were evaluated for their suitability for the partitioning of plutonium. Uranium from the Pu lean organic phase was proposed to be stripped using 0.01M $HNO_3$. The extraction behavior of fission products was also examined under the simulated AHWR spent fuel feed solution. Based on these observations, a reprocessing scheme has been proposed for the reprocessing of three component U, Pu and Th system arising out of the irradiated (Th, Pu)$O_2$ pins.

*Keywords:* Reprocessing; Uranium; Plutonium; Dialkyl amide; AHWR; TBP

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