Simplified nuclear fuel reprocessing flowsheet: a single-cycle PUREX process

M. Montuir, B. Dinh, P. Baron

CEA VALRHO DRCP/SCPS, BP 17171, F-30207 Bagnols sur Cèze Cedex, France
marc.montuir@cea.fr, binh.dinh@cea.fr, pascal.baron@cea.fr

Abstract *– A simplified flowsheet with only one purification cycle instead of three is proposed for reprocessing spent nuclear fuel using the PUREX process. A single-cycle flowsheet minimizes the process equipment required, the number of control points before transfer between process units, and the solvent and effluent quantities. For the uranium stream, an alpha barrier is used to strip any residual contaminants (Np, Th, Pu) from the uranium-loaded solvent. This additional step eliminates the need for a second uranium cycle. For the plutonium stream, an additional βγco-decontamination step and a higher plutonium concentration are required before the oxalate conversion step; a plutonium "half-cycle" is added downstream. The unloaded solvent from this half-cycle is returned to the selective plutonium stripping step, allowing significant plutonium half-cycle losses. It should be possible to reduce the number of stages in the half-cycle extraction step by recycling the raffinate to the upstream separation process.*