

Controlled precipitation of uranium and thorium in a complex organic phase

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The reprocessing steps of uranium oxide (UOx) in the French nuclear fuel cycle consist in two consecutive processes, PUREX (Plutonium Uranium Reduction Extraction) and MIMAS (Micronized MASTer blend). While these processes come up with good purity and yields, they also present several drawbacks^[1], e.g. the high number of steps, the management of primary and secondary effluents, the risk of plutonium proliferation or even the use of toxic compounds such as hydrazine. In this regard, several reprocessing alternatives are being considered^[1, 2]. The chemical co-precipitation of U, Pu or their analogues has been widely investigated^[3, 4]. However, very few studies report the co-precipitation directly in the organic phase. This study focuses on the development of a selective actinide precipitation (U and Th) from a loaded organic phase (Extractant = TBP or mono-amide)(Figure 1). This work is devoted to obtaining various porous organic/inorganic hybrid materials (Metal organic Frameworks, MOF) with well-defined structures by varying the organic linker. These linkers possess the advantage of being composed of only CHON atoms. Thereby, all of the linker elements can be released by the annealing step except for carbon. However, even though contributing to the structure contamination, its quantity remains relatively low. The MOF's morphology can be preserved^[5] upon thermal conversion to the actinide oxide form. This represents an advantage in nuclear fuel precursor design. In the end, this study has focused on the direct precipitation of actinides in the organic phase, enabling a one-step gain over the PUREX

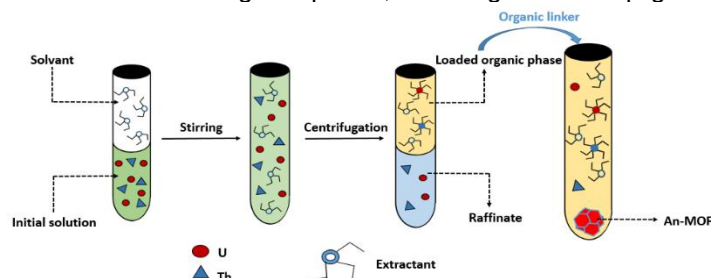


Figure 1 : Schematic diagram of experimental method

process.

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