

**Actinide separative chemistry**

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**Abstract** - Actinide separative chemistry has focused very heavy work during the last decades. The main « driving force » was nuclear spent fuel reprocessing: solvent extraction processes appeared quickly a suitable, an efficient way to recover major actinides (uranium and plutonium), and an extensive research, concerning both process chemistry and chemical engineering technologies, allowed the industrial development in this field. We can observe for about half a century a succession of PUREX plants which, if based on the same initial discovery (i.e. the outstanding properties of a molecule, the famous TBP), present huge improvements at each step, for a large part due to an increased mastery of the mechanisms involved.

And actinide separation should still focus R&D in the near future: there is a real, an important need for this, even if reprocessing may appear as a mature industry. We can present three main reasons for this.

First, **actinide recycling appear as a key-issue** for future nuclear fuel cycles, both for waste management optimization and for conservation of natural resource; and the need concerns not only major actinide but also so-called minor ones, thus enlarging the scope of the investigation.

Second, extraction processes are not well mastered at microscopic scale: there is a real, great lack in **fundamental knowledge**, useful or even necessary for process optimization (for instance, how to design the best extracting molecule, taken into account the several notifications and constraints, from selectivity to radiolytic resistivity?); and such a need for a real optimization is to be more accurate with the search of always cheaper, cleaner processes.

And then, there is room too for **exploratory research**, on new concepts-perhaps for processing quite new fuels- which could appear attractive and justify further developments to be properly assessed: pyro-processes first, but also others, like chemistry in “extreme” or “unusual” conditions (supercritical solvents, sono-chemistry, could be good exemples...)