

ACTINIDE EXTRACTION BY IONIC LIQUIDS

Jobin, E.¹, Ouadi, A.¹, Gaillard, C.¹, Billard, I.¹, Klimchuk, O.²

¹ IPHC-DRS, 23 rue du Loess, BP 28, 67037 Strasbourg cedex 2, France

² Laboratoire d'infochimie, Université L. Pasteur, 4, rue Blaise Pascal, 67000 Strasbourg, France

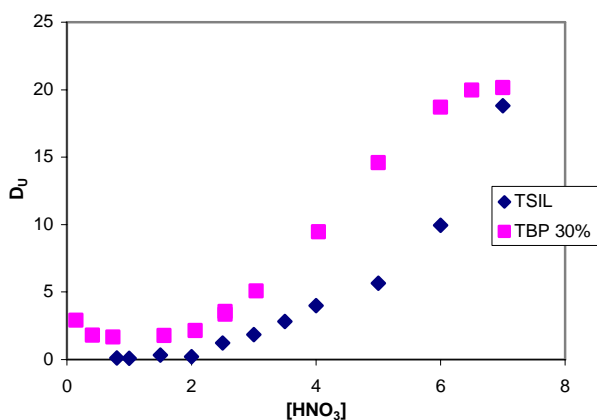
Room-temperature Ionic liquids (RTILs) have given rise to a great interest in the few last years in many fields of chemistry, notably for the separation of lanthanide and actinide through liquid-liquid extraction [1-4].

In the aim to understand the mechanisms of extraction of lanthanides and actinides in systems involving RTILs, we studied the extraction process of a system close to that industrially in use for nuclear combustible reprocessing: uranium by TBP in BumimTf₂N. Extraction and EXAFS experiments have been coupled with Fortran modelisation.

In a second step, we have synthesized various task-specific ionic liquids (TSILs) which gather the "green" properties of RTILs and some given specific properties like extraction efficiency: one TSIL bearing 2-hydroxybenzylamine unit [5], three others bearing a phosphoryl group [6] and one bearing a CMPO group. The first one has been grafted on silica to create functionalised columns and the others have been diluted in a classical RTIL (Me₃BuTf₂N). Thus the extraction ability of these TSILs towards actinides (americium and uranium) and their ability to separate europium and americium will be presented.

REFERENCES

- [1] Gaillard, C.; Moutiers, G.; Mariet, C.; Antoun, T.; Gadenne, B. et al. Potentialities of room temperature ionic liquids for the nuclear fuel cycle: Electrodeposition and extraction. *Ionic Liquids Iiib: Fundamentals, Progress, Challenges and Opportunities: Transformations and Processes* 2005, 902, 19-32.
- [2] Gaillard, C.; Billard, I.; Chaumont, A.; Mekki, S.; Ouadi, A. et al. Europium(III) and its halides in anhydrous room-temperature imidazolium-based ionic liquids: A combined TRES, EXAFS, and molecular dynamics study. *Inorganic Chemistry* 2005, 44, 8355-8367.
- [3] Mekki, S.; Wai, C. M.; Billard, I.; Moutiers, G.; Burt, J. et al. Extraction of lanthanides from aqueous solution by using room-temperature ionic liquid and supercritical carbon dioxide in conjunction. *Chemistry-a European Journal* 2006, 12, 1760-1766.
- [4] Mekki, S.; Wai, C. M.; Billard, I.; Moutiers, G.; Yen, C. H. et al. Cu(II) extraction by supercritical fluid carbon dioxide from a room temperature ionic liquid using fluorinated beta-diketones. *Green Chemistry* 2005, 7, 421-423.
- [5] Ouadi, A.; Gadenne, B.; Hesemann, P.; Moreau, J. J. E.; Billard, I. et al. Task-specific ionic liquids bearing 2-hydroxybenzylamine units: Synthesis and americium-extraction studies. *Chemistry-a European Journal* 2006, 12, 3074-3081.
- [6] Ouadi, A.; Klimchuk, O.; Gaillard, C.; Billard, I. Solvent extraction of U(VI) by task specific ionic liquids bearing phosphoryl groups. *Green Chemistry* 2007, 9, 1160-1162.



Uranium distribution ratios versus HNO₃ concentration