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USE OF BIFUNCTIONAL COMPOUNDS N, P FOR EXTRACTING URANIUM FROM AQUEOUS SOLUTIONS OF NITRIC ACID

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A new series of N, P bifunctional ligands was found to give excellent extraction properties for uranium from a nitric media [1]. Two of them, which only differ by the presence of an alkyl chain between their reactive sites, gave interesting performance in terms of extraction and selectivity towards zirconium. We could observe that the separation factor U/Zr increased from 21.7 for the unbranched molecule to 220 for the branched one.

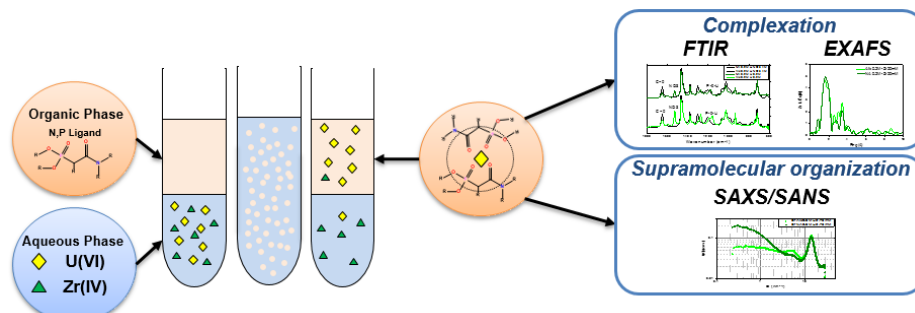
Based on the know-how of the LTSM group in the field of bifunctional ligands synthesis and study and of the CEA / DMRC teams in the data acquisition on major actinides [2], [3], the objective of this study was to explore the capacity of these new molecular architectures for uranium and zirconium extraction, and to understand their extraction mechanisms.

The extraction of cations, acid and water by the new bifunctional ligands were characterized by ICP-AES, coulometry and potentiometry. The molecular structures of the complexes were probed with different techniques such as infrared spectrometry and EXAFS. The organization of the ligands in supramolecular aggregates was assessed by X-ray and neutron scattering measurements, and related to their extraction properties.

It is indeed now well established that the mechanisms underlying the liquid-liquid extraction processes are based not only on the chelating properties of the extracting molecules [4], but also on their capacity to form supramolecular aggregates because of their amphiphilic nature. This study concentrates therefore on both molecular and supramolecular mechanisms to understand and master both chelation and self-assembly properties of these molecules in order to optimize extraction processes.

Thanks to the applied techniques, the influence of this alkyl chain on the selectivity has been put in regards with the complexation of the ligands with the uranium and zirconium and also, with the supramolecular organization in the organic phase.

Figure



References

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