



Contribution ID: 723

Type: Verbal

Lipophilic pyridine-2,6-bis(1H-1,2,3-triazol-4-yl) extractant for selective MA(III) extraction in SANEX-like processes

Monday, 14 May 2018 13:45 (15 minutes)

With the perspective of improving nuclear energy fingerprint by reducing the waste volume and its long-term radiotoxicity, the Partitioning and Transmutation (P&T) strategy is being developed as a viable solution.[1, 2] Nowadays great efforts are constantly dedicated to the development of compact and efficient hydrometallurgical partitioning processes based on CHON compliant hydrophilic or lipophilic ligands. In Europe, the Selective ActiNide EXtraction (SANEX) process, together with its variants, allow to separate Minor Actinides (MA) from the high active raffinate downstream of a PUREX-like process.[3] Recently, different heteroaromatic nitrogen donor ligands, such as bis-triazine-pyridine/bis-pyridine/phenantroline (BTP, BTBP and BT-Phen) ligands were developed showing a remarkable An/Ln selectivity, but most of them suffer of kinetic or stability problems in the harsh extraction condition.[4] In the last few years the pyridine-bis-triazole unit was found to be rather effective and selective in An separation from simulated nuclear waste.[3] In the present research work, the main features of the newly synthesized PyTri-Ethyl-Hexyl ligand were investigated in order to evaluate its potentialities in SANEX-like processes. Several liquid-liquid extraction tests were performed with a synthetic aqueous feed spiked with ^{241}Am , in some cases ^{244}Cm , and ^{152}Eu as representatives of MA and Ln families respectively and, in some cases, containing also macro-concentration of stable lanthanides (Ln, about 2.4 g/L). All batch extraction experiments were performed by mixing aqueous and organic phases for one hour, since equilibrium proved to be achieved within 20 minutes. The ligand behavior was investigated as a function of the nitric acid concentration in the aqueous feed, the ligand and the 1-octanol concentration in the organic solvent, in order to evaluate the impact of these fundamental parameters on the extracting properties. Preliminary information regarding the ligand radiochemical stability were obtained by performing liquid-liquid extraction tests and HPLC-MS analyses on solutions irradiated at 100 kGy by means of a Co-60 source or aged for several weeks, even in contact with 3 mol/L HNO_3 . The selectivity of the ligand core for MA was demonstrated, as well as its promising loading capacity. The promising results obtained justify further investigations on the ligand behavior, in order to better evaluate the selectivity and the stability towards hydrolysis and radiolysis.

This work has been partially supported by the Italian Ministry of Education, University and Research.

1. Ch. Poinssot, Energy (2014) 69:199-211.
2. L.B. Silverio, W.D.Q. Lamas, Energ Policy (2011) 39:281-289.
3. E. Macerata, E. Mossini, S. Scaravaggi, M. Mariani, A. Mele, W. Panzeri, N. Boubals, L. Berthon, M.C. Charbonnel, F. Sansone, A. Arduini, A. Casnati, J. Am. Chem. Soc. (2016) 138:7232-7235.
4. C. Wagner, E. Mossini, E. Macerata, M. Mariani, A. Arduini, A. Casnati, A. Geist, P. J. Panak, Inorg. Chem. (2017) 56:2135-2144.

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Session Classification: NFC 1

Track Classification: Chemistry of Nuclear Fuel Cycle, Radiochemical Problems in Nuclear Waste Management