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Abstract (600 word limits)

Among the fission products present in the spent fuel, technetium exhibits a singular behaviour in reprocessing operations performed by solvent extraction. Indeed, this strong acid readily dissociates to form the oxo-anion TcO4- that may interfere with uranium(VI), plutonium(IV) and zirconium(IV) in the extraction cycles of the PUREX process. [1-3] This presentation will be focused on the uranium-technetium complex with TBP and on its non-radioactive rhenium surrogate. Despite the large set of distribution data available for rhenium and technetium extraction with TBP [4], the structures of the co-extracted complexes remain largely unknown. However, it is important to understand clearly the extraction mechanism of technetium with TBP in the PUREX process to optimize the separation process and to correctly model its behavior during the extraction steps. Based on distribution data available in the literature, a thermodynamic model was developed for the extraction of technetium with TBP. A good representation of uranium and technetium distribution data was obtained when considering the formation of (HTcO4)(TBP)n complexes, as well as mixed UO2(NO3)(TcO4)(HNO3)x(TBP)n, complexes where one pertechnetate anion replaces one nitrate in the uranium coordination sphere in the complexes UO2(NO3)2(HNO3)x(TBP)n. Combination of complementary spectroscopic techniques (FT-IR and X-ray absorption) supported by theoretical calculations (density functional theory) enabled full characterization of the formation of mixed uranium−technetium species and also of mixed uranium-rhenium species. Details on the coordination of the uranium-technetium complex are provided with the help of DFT calculations and XAS measurements.

Biography (200 word limit)

Research engineer at CEA Marcoule, Dr Pauline Moeyaert research is focused on the comprehension and modeling of physicochemical phenomena involved in hydrometallurgical processes. The aim of her work is to improve the efficiency of processes or to develop new processes for the nuclear fuel cycle

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