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Characterizations of high activity solid deposit samples from fission products tanks

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For the dismantling of reprocessing facilities in Marcoule, deposit solid samples coming from fission products tanks have been characterized in the laboratories and hot cells of the ATALANTE facility. These experiments consisted in physicochemical measurements on high activity solid samples, specific dissolutions developments and extensive characterizations of dissolution solutions and solid residues.

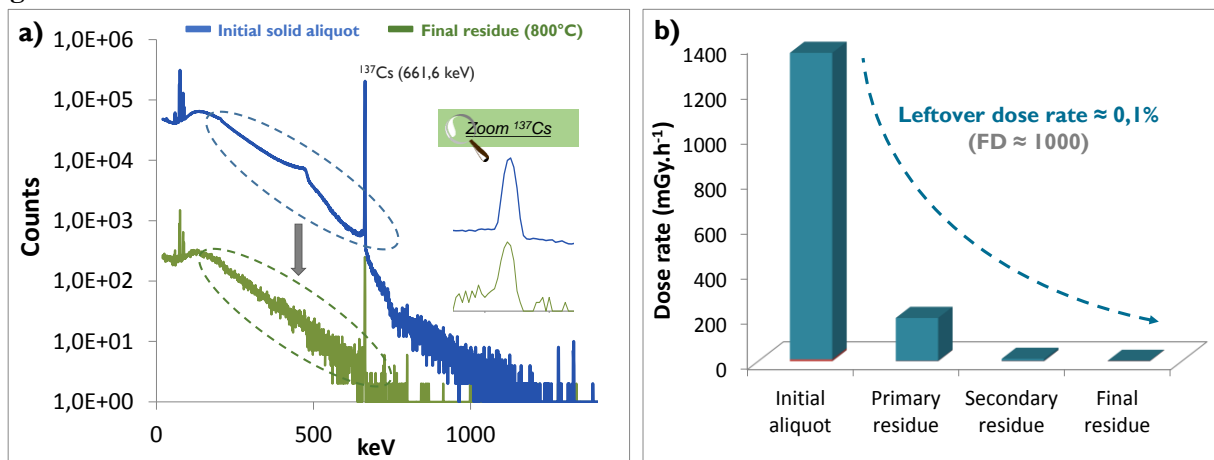
This work required R&D developments in both the chemical and analytical fields: dissolution conditions optimization, Cs, Zr and Sr specific decontaminations, qualitative analyses on solid residues... Many analytical techniques have been implemented in hot cells and glove box laboratories for these characterizations: γ and α spectrometry, isotope dilution by TIMS, L-line X-ray fluorescence, ICP/AES, ICP/MS, ion exchange chromatography, Cherenkov counting... The dissolution process optimizations allowed to retain a dissolving protocol presenting the best dissolution yield:

- of small actinide amounts initially present in deposit solid samples (such as Pu, from 0.7 to 1.4 mg.g⁻¹ of dry solid aliquot involved),
- of ¹³⁷Cs wich concentrates almost all of the initial γ activity (> 99%, up to 1.10¹⁰ Bq.g⁻¹ of dry solid aliquot involved).

These developments have resulted in obtaining final dissolution residues whose dose rate does not exceed 0.1% of the initial solid aliquot dose rate (initially 1.4 Gy.h⁻¹ for 400 mg). These characterizations allow determining the composition and nature of the fission products raffinates present in such reprocessing equipment. These data are essential for the definition of recovery scenarios and waste management.

Some of the very specific analytical developments performed for these characterizations in hot cells, such as selective Cs decontamination by extraction chromatography and direct analysis of solid residues by L-line X-ray fluorescence dedicated to actinide analysis are presented.

Figures



Example of dissolution performance: a) comparison of qualitative gamma analyzes on solid, b) decontamination factor