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# Radioanalytical determination of actinides in refractory matrices by linking alkali fusion with solvent extraction and chromatography extraction.

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In radiochemical analyses with environmental or industrial samples sometimes happens that certain matrices have a refractory behaviour and usual leaching processes cannot deal with its dissolution properly. There are in the bibliography different ways to solve this problem as the use of microwaves digestions or HF digestions (or both together) and also fusion techniques among others. This work presents a method used previously for ICP-MS measurements that have been modified and readapted for the digestion of refractory samples followed by a separation process with solvent extraction for the determination of actinides (U and Th isotopes) in refractory samples by alpha-spectrometry. The separation process was made also with extraction chromatography resins (UTEVA resins) in order to test both separation methods and to choose the more suitable one.

In a first stage, we worked with samples that were only leached with aqua regia followed of separation process with TBP to finally electroplate the isolated uranium and thorium fractions in stainless-steel dishes. The samples were measured by alpha-spectrometry with PIPS detectors. Aliquots of these samples were as well measured via gamma spectrometry in order to check the results produced by alpha spectrometry. Disagreement were found between the results obtained by both techniques due to the no total dissolution of the samples analysed by alpha-spectrometry.

In a second stage, the found disagreement was solved with the application of an alkali fusion technique for a total dissolution of the sample before the application of the separation methods and alpha spectrometric measurements. The fusion technique with KHSO4 is easily applicable, fast (it takes less than two hours instead of ten-twenty necessaries in leachings) and it does not need of sophisticated tools to be executed.

Regarding the use of UTEVA resins or TBP process for the separation of actinides, it is necessary to point out that both techniques show similar chemical yields for Uranium and Thorium isotopes aulthough the UTEVAS resins are less time-consuming than the TBP process. In addition, the possibility to reuse the resins makes them more useful from an economical point of view, in opposition to the general idea that many laboratories have about this topic.

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