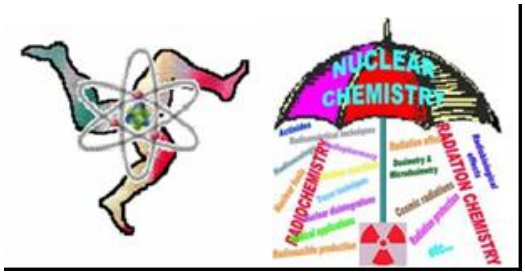

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Multi-dimensional chromatographic separations of actinides

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Many radioisotopes are released in the environment from our use of the nuclear energy. Among these, actinides are a health concern due to their long environmental persistence and the risk associated with internal dosimetry. The simultaneous analysis of actinides (i.e. Th, U, Np, Pu and Am) is labour-intensive because 1) they are found at ultra trace levels, 2) are difficult to dissolve, 3) have sometimes instable valence and 4) interfere together and with the matrix constituents.
A new partly-automated extraction chromatography (EXC) separation methodology was developed to overcome those issues. Environmental samples are dissolved by fusion in 2M hydrochloric acid in order to ensure complete dissolution of refractory species. Using TEVA and DGA resins, multidimensional chromatography based on valence and media adjustment was performed in order to separate each radioelement, thus limiting the presence of isobaric and molecular interferences during the analysis. On-line valence adjustment is performed to facilitate elution or improve retention of some actinides. Eluted fractions, containing the separated actinides, are measured by either alpha spectrometry and/or inductively coupled plasma mass spectrometry (ICP-MS), providing complementary isotopic information. Because of the specificity of each type of instrumentation, effect of matrix constituents were assessed.
This approach has great potential for automation of emergency responses methodologies, improving sample throughput while minimizing human error and the necessity to be performed by highly-qualified personnel. Initial automation efforts will be presented.

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