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New analytical method for actinide (Pu, Am, U, Th, Np) separation based on diglycolamide resin (DGA)

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One of the most critical part in the treatment of liquid radioactive wastes is the separation process of tervalent actinides, especially that of Am in acidic solutions. After decades of investigation a new extraction chromatographic material, the DGA resin was developed with good extraction properties for all actinides, moreover extremely high extractability towards Am1.
Our goal was to separate major and minor actinides, i.e. U, Th, Pu, Np, Am (Cm) from radioactive waste samples and determine the radionuclides by α spectrometry. DGA is a good candidate material for the extraction chromatographic separation of actinides in tetra-, hexa- and (moreover) in tervalent oxidation states due to the high distribution ratios from a wide range of concentration of nitric and hydrochloric acid solutions. It shows potential for the simultaneous separation of actinides with the use of a single column.
The distribution ratios of Th(IV), U(VI), Pu(IV) and Am(III) on DGA have been determined in hydrochloric and nitric acid media1. In our laboratory extraction studies were carried out on various oxidation states of the actinides including Np species and on the effect of several possible interferences (Ca2+, Fe2+, Fe3+, SO42-, S2O82-, S2O52-, SO32-, N2H4, NO2-, I-) by batch and/or column uptake experiments using N,N,N',N'-tetra-n-octyldiglycolamide (DGA Resin, Normal) produced by Triskem ©2. Based on the measured distribution ratios two new methods were developed for Th, U, Pu, Am and Np separation in model solutions. Oxidation state adjustment of actinides was performed before and during on-column separation. The methods have been tested by the analysis of liquid radioactive waste samples originating from nuclear power plant using alpha spectrometry. Performance parameters of the procedures such as chemical recoveries and decontamination factors will be presented.

1 Horwitz, E.P., McAlister, D.R., Bond, a. H., Barrans Jr., R.E. Solvent Extraction and Ion Exchange. 23, 319-344 (2005)
2 http://www.triskem-international.com

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