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Thiacalix[4]arenes: radiation stability and Eu/Am extraction in synergistic systems with COSANs

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This study deals with the effects of irradiation on the stability and extraction properties of thiacalixarenes¹, the prospective liquid-liquid extractants for the extraction of actinides and lanthanides from aqueous solutions. Thiacalixarenes (T1, T2) dissolved in cyclohexanone and 1,2-dichloroethane were irradiated with ⁶⁰Co gamma rays or accelerated electrons with energy of 4.5 MeV. The absorbed doses ranged from 0 to 100 kGy.

The extraction properties towards europium and americium, as lanthanide and actinide representatives, were studied in synergistic systems. The combinations of two thiacalixarene extracting agents, three COSAN molecules and three diluents (chlorobenzene, nitrobenzene and 1,2-dichloroethane) were evaluated.

For the determination of residual concentration, the HPLC method was used and compared with the assessment of the change of the D(Am) and D(Eu) values in solvent extraction experiments. The aqueous phase consisted of a solution of COSAN (chloro-protected bis(1,2-dicarbollide) cobaltic acid) in 0.1mol/l nitric acid; solutions of thiacalixarene T2 in 1,2-dichloroethane were used as the organic phase. Distribution ratios D for ¹⁵²Eu and ²⁴¹Am and their mutual separation factors were evaluated. The activity of aqueous and organic phase was measured via gamma spectrometer with HPGe detector.

The results obtained from both methods correspond to each other and the decline in the extraction behaviour can be derived from the residual concentration determination and otherwise. Both thiacalixarenes seem to be more stable in the irradiated cyclohexanone samples than in the 1,2-dichloroethane samples which is in good agreement with the state that during cyclohexanone radiolysis less aggressive intermediates are produced comparing with the latter case.

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REFERENCES

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