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Radiation stability and extraction properties of thiacalixarenes

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This study deals with the effects of irradiation on the stability and extraction properties of thiacalixarenes ¹, the prospective liquid-liquid extractants for the extraction of actinides and lanthanides from aqueous solutions. Thiacalixarenes dissolved in various organic diluents were irradiated with ⁶⁰Co γ rays or accelerated electrons with energy of 4.5 MeV. The absorbed doses ranged from 0 to 100 kGy. Possible effect of the presence of aqueous phase during irradiation was also investigated.

The extraction properties were studied in synergistic systems. The aqueous phase consisted of a solution of cosane (chloro-protected bis(1,2-dicarbollide) cobaltic acid) in 0.1 mol/L nitric acid; solutions of thiacalixarenes in nitrobenzene or 1,2-dichloroethane were used as the organic phase. Distribution ratios D for ¹⁵²Eu and ²⁴¹Am and their mutual separation factors were evaluated. The concentration of thiacalixarene in the irradiated samples was measured using HPLC and the activity of aqueous and organic phase was measured by γ spectrometer with HPGe detector.

The results confirmed previously published data ² which showed a strong synergistic effect in the systems containing thiacalixarenes and cosanes. This effect depends on substituents at the lower and/or upper rim. It was demonstrated that the synergic effect is independent of the used type of cosane (chloro-, resp. bromo-protected bis(1,2-dicarbollide) cobaltic acid or bis(1,2-dicarbollide) cobaltic acid) and it strongly depends on the diluent used in the organic phase. The studied systems proved not to be very stable towards the radiation. After irradiation with the dose of 20 kGy, the distribution ratios dropped to one half for thiacalixarene solutions in nitrobenzene; they dropped even to one tenth for dichloroethane solutions at the same dose.

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REFERENCES

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