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Study of HDEHP-PAN solid extractants for ⁹⁰Sr determination

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Application of solid extractants containing di-(2-ethylhexyl)phosphoric acid (HDEHP) in the support based on modified polycrylonitrile (PAN) has been proposed at the CTU in Prague, Department of Nuclear Chemistry, for the determination of ⁹⁰Sr by means of measuring the activity of its ⁹⁰Y daughter utilising a procedure similar to that developed by Burnett et al. in 1975 for the determination of ²²⁸Ra ¹. For the introductory study, ¹⁵²Eu and ¹³³Ba were used as chemical homologues of ⁹⁰Y and ⁹⁰Sr. For these radionuclides, dependences of mass distribution coefficients (D_g) on the nitric acid concentration were measured for several types of HDEHP-PAN solid extractants; the results obtained were compared with the data presented by Horwitz et al. in his 1975 paper ². For one of the solid extractants, similar dependence was also determined for the hydrochloric acid. The mechanism of the Eu³⁺ and Ba²⁺ ions was confirmed to follow the theoretical two-phase equation for the chelating extractants. The shifts of the curves measured for various solid extractants could be ascribed to the different amounts of HDEHP in the extractants. Further, influence of the presence of nitrates (total salinity), calcium (Sr homologue) and iron (Y major interferent) ions on the D_g values were determined. For both Eu and Ba, a decrease of D_g values with increasing nitrates concentration was observed. As expected, the D_g(Eu) values were suppressed already by relatively low iron concentrations. The influence of iron ions could be masked by the addition of ascorbic acid if working in hydrochloric acid. The D_g(Eu) values were not influenced by the presence of calcium while, as expected, uptake of barium at low acidities was strongly suppressed already by relatively low calcium concentrations. The results obtained make application of solid extractants containing HDEHP in PAN support prospective for ⁹⁰Sr determination.

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1. Burnett W. C., Cable P. H., et al.: Radioactivity and Radiochemistry 6, 36 (1995).
2. Horwitz E. P., Bloomquist C. A. A.: J. Inorg. Nucl. Chem. 37, 425 (1975).

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