



Contribution ID: 306

Type: Poster

Study of HDEHP-PAN solid extractants for ^{90}Sr determination

Thursday, 22 April 2010 12:00 (20 minutes)

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 ^{90}Sr by means of measuring the activity of its ^{90}Y daughter utilising a procedure similar to that developed by Burnett et al. in 1975 for the determination of ^{228}Ra $^{21}\text{}$. For the introductory study, ^{152}Eu and ^{133}Ba were used as chemical homologues of ^{90}Y and ^{90}Sr . 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 Eu^{3+} and Ba^{2+} 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 $D_{\text{g}}(\text{Eu})$ 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 $D_{\text{g}}(\text{Eu})$ 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 ^{90}Sr determination.

This work was supported by grant MSM 6840770020.

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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Session Classification: Poster Session - Separation Methods, Speciation

Track Classification: Separation Methods, Speciation