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Study of europium and americium uptake on solid extractant with CMPO and polyacrylonitrile from diluted nitric acid solutions

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Octyl(phenyl)-N,N'-diisobutylcarbamoylmethylphosphine oxide (CMPO) extraction agent and polyacrylonitrile (PAN) as binding polymer were used for production of CMPO-PAN solid extractant. The material was previously studied for application in column chromatography for actinoids separation [1]. High uptake of americium and europium on CMPO-PAN solid extractant was observed in diluted nitric acid solutions (0.001-0.1 mol/L) contrary to minimal uptake by CMPO itself. A set of experiments was performed for explanation of this effect that cannot be solely explained by adsorption on PAN support. Materials prepared by modification of the original procedure were tested and compared. Influence of CMPO content in the composite and total nitrate ion concentration in the solution on the uptake were determined for several acidities. Selected materials were subjected to FT-IR analysis to study interaction of the support polymer and CMPO agent. Europium extraction isotherms were measured in the solution of 0.01M HNO₃ for capacity determination. It was found that addition of sodium nitrate (0.1 mol/L) increases maximum europium capacity by more than an order of magnitude to the value that was determined in 3M HNO₃. The observations indicated that europium and americium uptake mechanism on CMPO-PAN is different in solutions with diluted and more concentrated nitric acid and is influenced by total nitrate concentration.

[1] Kameník J., Šebesta F. (2006), Czechoslovak Journal of Physics 56, D493-D500.

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