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## Simultaneous extraction of radionuclides with crown ethers and N,N,N',N'-tetraalkyl diglycolamides mixtures in fluorinated diluents

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Simultaneous recovery of long living radionuclides (cesium, strontium and actinides) from high level liquid waste (HLLW) allows to reduce the total volume of the waste and the costs of waste storage. The UNEX process using solvent based on chlorinated cobalt dicarbollide (CCD), polyethylene glycol and phenyloctyl-N,N-diisobutylcarbamoylmethylene phosphine oxide (CMPO) has been proposed for simultaneous recovery of the radionuclides. The main drawback of UNEX process is complicated synthesis of CCD. So development of new solvents and processes on the base of commercially available extractants is an important task.

N,N,N',N'-tetraalkyl diglycolamides (DGA), well-known ligands for actinides extraction, can also be used for strontium recovery from nitric acid solutions. At the same time the solutions of crown ethers in fluorinated diluents extract cesium from acidic solutions. Thus the mixture of DGA and crown ether is a promising solvent for simultaneous recovery of long living radionuclides from HLLW.

In radiochemical technology saturated hydrocarbons are traditionally used as diluents for neutral ligands. For instance n-dodecane is traditionally used as a diluent for DGA. The main drawback of such diluent is low loading capacity on extracted metals and as a result tendency of third phase formation at high metal concentrations. The usage of fluorinated diluents such as meta-nitrobenzotrifluoride (F-3) allow to increase the loading capacity of the extractant and prevent third phase formation. It is also known that the most effective diluents for crown ethers are fluorinated alcohols.

The goal of this work was to develop a new solvent on the base of crown ether and DGA for simultaneous extraction of actinides, lanthanides and fission products. The extraction of cesium, strontium, americium and lanthanides with different DGA (N,N,N',N'-tetrabutyl diglycolamide, N,N,N',N'-tetrahexyl diglycolamide, N,N,N',N'-tetraoctyl diglycolamide), crown ethers and their mixtures was studied.

The solution of di-benzo-21-crown-7 and N,N,N',N'-tetraoctyl diglycolamide in fluorinated diluent was chosen as a new solvent. The extraction flowsheet was developed and tested in laboratory scale using simulated solutions with high concentration of lanthanides. Optimum conditions for simultaneous recovery of cesium, strontium and actinides from nitric acid solutions, scrubbing and stripping were found.

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