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New polar fluorinated diluents for diamide ligands

Nuclear waste management is nowadays based on the usage of light hydrocarbon liquids as diluents in extraction technology. PUREX process deals with tributylphosphate solution in n paraffins; various extraction processes developed for high level waste treatment also use light hydrocarbon diluents (e.g. dodecane) to be PUREX-compatible.

Heavy polar diluents that are widely studied for purposes of extraction are an alternative to light diluents. The most attractive among them are fluorinated diluents. Polar fluorinated diluents have some advantages over hydrocarbons, e.g. high chemical and radiation stability, high density, low fire risk. Fluorinated compounds of various classes (ethers, esters, nitroaromatic compounds, fluorinated sulfones) have been tested as possible diluents for neutral extractants. The using of polar fluorinated diluents in solvent extraction allow to significantly increase the extraction capacity and solubility of neutral ligands.

In the present work new polar fluorinated aromatic-free compounds were tested as diluents for various diamide extractants. New diluents - 2,2,3,3,4,4,5,5,6,6,7,7-dodecafluorheptylmethyl ether (DDFHME), 2,2,3,3,4,4,5,5,6,6,7,7-dodecafluorheptyl acetate (DDFHA) 1,1,2,2,3,4,4,10,10,11,11,12,12,13,13-hexadecafluor-6,8-dioxatridecane (Formal-2) were compared with well known meta-nitrobenzotrifluoride (F-3) and trifluoromethylphenyl sulfone (FS-13). The extraction ability of diamides of dipicolinic acid, diamides of 2,2'-dipyridyl-6,6'-dicarboxylic acid, diamide of diglycolic acid in polar diluents towards some radionuclides and post-transition metals were studied.

It was found that the extraction ability of diamide ligands could be highly increased while using DDFHME and Formal-2 as diluents.

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