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Various Flowsheets of Actinides Recovery with Diamides of Heterocyclic Carboxylic Acids

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Various neutral ligands are studied as potential ligands for separation of actinides from lanthanides. The most effective extractants for selective recovery of actinides from high level wastes are poly nitrogen compounds. The presence of several "soft" donor atoms in ligand structure allows to reach very high Am/Eu separation factor values. Recently a new class of neutral polydentate compounds –diamides of heterocyclic dicarboxylic acids –was proposed for recovery of f-elements from nitric acid. Ligands belonged to this class possess in their structure both "hard" oxygen and "soft" nitrogen atoms. Such combination of coordination centers provides high extraction ability of ligand toward f-elements and better affinity to actinides than lanthanides.

Diamides of 2,6-pyridine-dicarboxylic acid, diamides 2,2'-dipyridil-6,6'-dicarboxylic acid, diamides of 6,6''-(2,2':6',2''-terpyridine)dicarboxylic acid, amides of 1,10-phenanthroline-2-carboxylic acid and diamides of 1,10-phenanthroline-2,9-dicarboxylic acid were synthesized and tested for extraction of actinides (III, IV, V, VI) and lanthanides (III) from nitric acid solutions.

In our work we studied extraction properties of diamides of 2,6-pyridine-dicarboxylic acid (DPA) and diamides 2,2'-dipyridil-6,6'-dicarboxylic acid (Dyp).

DPA effectively extract actinides (III, IV, VI) and lanthanides (III) from nitric acid solutions. Actinides are extracted better than lanthanides. The Am/Eu separation factor up to 6 for extraction from 1-2 M HNO₃ can be reached. Solutions of DPA in polar fluorinated diluents have very high loading capacity on extracted metals and can be used for recovery of actinides from wasted with high lanthanides content (more than 17 g/L)

Dyp have in their structure two pyridine rings and are more selective extractants than DPA. Americium can be selectively extracted from lanthanides with separation factors more than 10.

In the present work two flowsheets for actinides recovery and separation them from lanthanides on the base of DPA and Dyp were developed. Both schemes were tested in laboratory scale using simulate solutions of raffinates with high content of fission products.

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