Development of Recovery Process of Platinum-group Metals from HLLW for Stable Production and Volume Reduction of Homogeneous Vitrified Object

(22) Extraction of Platinum Group Metals from Nitric Acid Solutions Using Thiodiglycolamides and Tertiary Amines

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Synergistic extraction of Pd, Rh and Ru from highly concentrated nitric acid solutions was investigated using mixed solvents of newly synthesized thiodiglycolamide (TDGA) and tertiary amine compounds.

Keywords: solvent extraction, synergistic effect, platinum group metals, thiodiglycolamide, tertiary amine

1. Introduction In order to improve the vitrification process, the decrease in the concentration of platinum group metals (PGM) in HLLW is imperative. For this purpose, we have been studying the extraction of PGM from HCl and HNO₃ solutions with mixed solvents of TDGA and amine-type extractants [1]. In this study, we investigated extraction of Pd, Rh and Ru from highly concentrated HNO₃ solutions with mixed solvents of newly synthesized N,N'-dimethyl-N,N'-ditolyl-thiodiglycolamide and N,N'-dibutyl-N,N'-ditolyl-thiodiglycolamide (MTTDGA and BTTDGA) and tertiary amine-type extractants: tri-n-octylamine and tris(N,N-di-2-ethylhexyl-ethylamide)amine (TOA and EHTAA).

2. Experiments TOA and EHTAA were used without further purification. TDGAs were synthesized. The extraction operation was carried out batchwise: the extractants diluted in toluene, Pd(II), Rh(III) and Ru(III) in HNO₃. Both of TDGA extracted about 100% Pd(II) without TOA or EHTAA in wide range of HNO₃ concentrations. In case of Rh(III), mixed solvents of TDGA and tertiary amines improved the extractability. In particular, a mixed solvent of TDGA and EHTAA extracted ~100% Rh(III), that means a synergistic effect for Rh(III) occurred. Regarding Ru(III), a significant synergistic effect was not observed. However, ~90% Ru(III) could be extracted from highly concentrated HNO₃ (8 M) using higher concentration of MTTDGA.

3. Conclusion Considering the experimental results, we proposed a mutual separation flow that extracts PGM in following order: Pd → Ru → Rh (Fig. 1).

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References

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