

# ガラス固化体の高品質化・発生量低減のための白金族元素回収プロセスの開発

## (22) チオジグリコールアミド系とアミン系抽出剤を用いた白金族元素抽出

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

\*Cibula Michal<sup>1</sup>, 稲葉 優介<sup>1</sup>, 竹下 健二<sup>1</sup>, 成田 弘一<sup>2</sup>

<sup>1</sup>東京工業大学, <sup>2</sup>産業技術総合研究所

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 HNO<sub>3</sub> 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 HNO<sub>3</sub> 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 HNO<sub>3</sub>. Both of TDGA extracted about 100% Pd(II) without TOA or EHTAA in wide range of HNO<sub>3</sub> 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 HNO<sub>3</sub> (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).

**Acknowledgement** This work was financially supported by "The R&D program for advanced nuclear power systems" organized by MEXT.

### References

[1] H. Narita, M. Tanaka and K. Takeshita, Japan Patent

2012-025994.; H. Narita, K. Morisaku and M. Tanaka, *Solvent Extraction and Ion Exchange*, **33**, 1-10 (2015).

\*Michal Cibula<sup>1</sup>, Yusuke Inaba<sup>1</sup>, Kenji Takeshita<sup>1</sup>, Hirokazu Narita<sup>2</sup>

<sup>1</sup>Tokyo Institute of Technology, <sup>2</sup>National Institute of Advanced Industrial Science and Technology (AIST)

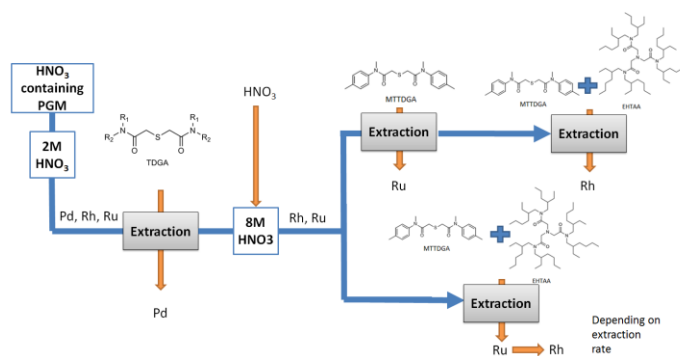


Fig. 1. Proposed mutual separation flow