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Electrochemical recovery of fission platinoids (Ru, Rh, Pd) from simulated high-level liquid waste

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ABSTRACT

Electrochemical behavior of ruthenium(III), rhodium(III) and palladium(II) present in the simulated high-level liquid waste (SHLLW) was studied, at 298 K, to explore the feasibility of recovering these fission platinoids from high-level liquid waste (HLLW). The cyclic voltammogram of SHLLW at platinum electrode consisted of a surge in cathodic current occurring at a potential of –0.38 V (Vs. Pd), which resulted in a large cathodic wave at –0.55 V (Vs. Pd) was attributed to the reduction of platinoid ions into their metallic forms. At stainless steel electrode, the onset of reduction occurred at –0.43 V (Vs. Pd), which resulted in a cathodic wave at –0.7 V (Vs. Pd). Electrolysis of SHLLW was carried out at various cathodic potentials and the recovery was in the order Pd >> Rh ~ Ru. The total recovery of ruthenium, rhodium and palladium increased with increase of applied potential and about 42% was recovered at the applied potential of –1.0 V (Vs. Pd) in 4 h. X-ray diffraction indicated the presence of all the three metals in the deposit and EDS analysis indicated the presence of palladium to the extent of 80–85% in all deposits.

Keywords: Ruthenium; Rhodium; Palladium; Voltammetry; Electrodeposition

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