SELECTIVE EMULSION LIQUID MEMBRANE EXTRACTION OF PALLADIUM FROM SIMULATED SEMICONDUCTOR WASTE

NURUL ASHIDA BINTI ABDULLAH

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Faculty of Chemical and Natural Resources Engineering
Universiti Teknologi Malaysia

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ABSTRACT

Semiconductor waste from electroplating industry becomes a major concern in term of environmental problem and monetary value due to toxicity and novel metal in the wastewater. In electroplating processes, several metals have been used such as silver plating, nickel plating, palladium plating and copper plating. The targeted electroplating metal in this study is palladium. There are several methods have been research to find the suitable method that have high selectivity on extraction of Palladium from simulated wastewater and one of the promising methods is Liquid Membrane technique. Liquid membrane system comprises of three liquid phases; feed phase (wastewater), liquid membrane organic phase and receiving phase. Emulsion liquid membrane is a liquid membrane in which the membrane phase of an emulsion is dispersed into the feed phase to be treated. This method was investigated as an alternative process for treatment and also recovery of Palladium from simulated semiconductor waste. The important parameters governing the extraction of Palladium such as concentration of carrier and stripping agents, types of stripping agents, contact time and treat ratio were investigated. This experiment has been conducted using a mixer-settler in a batch system. The results show that the mobile carrier D2EHPA is selective toward Palladium metal in simulated semiconductor waste. The optimum Palladium extraction was around 90% obtained by using 0.1M D2EHPA, 0.1M H₂SO₄ stripping agent, 5 minutes contact time, and 1: 3 treat ratio. However, the study on emulsion stability shows unstable results due to the leakage and swelling occurrence during the experiments. As a conclusion, the research shows high possibility of palladium extraction from simulated semiconductor waste using ELM process.
ABSTRAK

Sisa semikonduktor daripada industri penyaduran menjadi tarikan utama dalam masalah alam sekitar dan nilai kewangan kerana ketoksikan dan logam berharga yang hadir di dalam air sisa tersebut. Di dalam proses penyaduran, beberapa logam telah digunakan seperti penyadur perak, penyadur nikel, penyadur paladium dan penyadur tembaga. Logam penyadur yang disasarkan dalam kajian adalah paladium. Terdapat beberapa kaedah yang sesuai yang mempunyai kebolehan tinggi dalam mengekstrak paladium dari sisa air simulasi dan salah satu kaedah pengekstrakan adalah teknik membran cecair yang mana terdiri daripada tiga fasa cecair; fasa suapan (sisa air), fasa organic membran cecair dan fasa penerima. Sistem emulsi membran cecair sebagai kaedah alternatif dikaji untuk rawatan dan perolehan semula logam Paladium daripada sisa simulasi semikonduktor. Parameter penting dalam menentukan kemampuan pengekstrakan logam Paladium seperti kepekatan pembawa dan ejen pelucut, jenis ejen pelucut, nisbah rawatan bagi emulsi kepada fasa suapan dan masa pengekstrakan dikaji. Proses ini telah dijalankan dengan menggunakan sistem pengadun-pemisah berkelompok. Keputusan menunjukkan pembawa D2EHPA adalah tepilih terhadap logam paladium dalam sisa simulasi semikonduktor. Pengekstrakan optima logam Paladium adalah sekitar 90% yang diperolehi dengan menggunakan 0.1M D2EHPA, 0.1M H2SO4 agen pelucut, 5 minit masa pengekstrakan, dan 1:3 nisbah rawatan. Walau bagaimanapun, kajian terhadap kestabilan emulsi menunjukkan ketidakstabilan disebabkan kebocoran dan kebengkakan emulsi semasa eksperimen. Kesimpulannya, kajian ini menunjukkan proses ELM mempunyai potensi yang tinggi dalam pengekstrakan palladium dari sisa semikonduktor.
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