

Selective extraction, separation and recovery of Cu(II) in presence of Zn(II) and Ni(II) from leach liquor of waste printed circuit board using microcapsules coated with Cyanex 272

Abstract

The study was conducted to optimize the selective extraction and recovery of Cu(II) in the presence of Zn(II) and Ni(II) from the leach liquor of waste printed circuit boards (PCBs). The extraction experiments were carried out according to 2⁴ factorial design of experiment to optimize the extraction factors. The design was analyzed using MINITAB to determine the main effects and interactions of the chosen extraction factors. The factors chosen were: extraction pH, amount of Cyanex 272 in dispersed phase during MC-Xs preparation, amount of MC-Xs and temperature. The pH, amount of MC-Xs and temperature were found to be statistically significant. The optimized experimental conditions for the Cu(II) extraction in presence of Zn(II) and Ni(II) were extraction pH 6.0, amount of Cyanex 272 in dispersed phase 3 g, amount of MC-Xs 2.5 g and Temperature 45 °C. Factorial design of experiment was also carried out to determine the Cu(II) stripping factors from the loaded MC-Xs using H₂SO₄ solution. The liquid-liquid extraction Cu(II) was conducted with the prime aim to evaluate the nature of Cu(II) complex extracted by Cyanex 272. Results showed that the extraction species is [Cu(HA₂)(Ac)·2HA]. Finally, a complete process for the separation and recovery of Cu(II), Zn(II) and Ni(II) from the leach liquor of waste PCBs was conducted based on the optimized experimental condition and effect of pH on extraction.