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Selective Recovery of Copper from Lead and tin by Solvent Extraction of Method

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ABSTRACT: High electrical conductivity of metals such as gold, silver and platinum extensively increased the use of these metals in electronics. In addition to the platinum group metals, large amounts of copper, tin and lead are present in E-Waste. For an effective recovery of precious metals, and also from an economic perspective, it is essential to recover the mentioned metals. In this paper, separation of copper from tin and lead by solvent extraction was studied. Fluoroboric acid and LIX984N was used as leachant and organic solvent, respectively. Effective factors such as the concentration of organic solvent, pH, temperature and concentration of copper on the extraction of copper were investigated. The treatment of leach liquor for solvent extraction of copper with LIX984N showed that 20% LIX984N in kerosene, a 30 min period of equilibrium, and a pH of 3 were sufficient for the extraction of Cu(II) and 99.99% copper can be recovered from the leached solution.

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1- Introduction

Wastes from electrical and electronic equipment (WEEE) are the most rapid waste category [1]. Therefore, the recycling of this waste is very important [2]. In fact, WEEE are one of the most main source for recovery of valuable metals [3]. Copper is the major metallic component in the Electronic waste; hence a process for selective recovery of copper by leaching and solvent extraction is explored in the present investigation. The various leaching agents were used for recovery of metals from WEEE such as: HCl [4], HNO_3 [5] and H_2SO4 [6]. Present study focuses on the recovery of copper from Electronic waste concentrate by Fluoroboric acid dissolution and selective extraction of copper from leach solution by using LIX984N as a solvent diluted in the kerosene.

2- Methodology

Batch experiments were carried out in a flask containing equal volumes (20 mL) of aqueous and organic solutions. Then, the produced mixture was transferred to a 250 mL separation funnel. The two layers were allowed to settle and separate. pH of aqueous layer was measured and the concentration of Cu(II) in aqueous solution was determined by atomic adsorption spectroscopy.

3- Main results

The effect of pH on the extraction of these metals was investigated in the pH range of 0.8-2.5 using 20% (v/v) LIX984N. Figure 1 shows that the extraction of copper and lead was increased by an increase in pH value. In addition, this extractant was not suitable for extraction of tin.

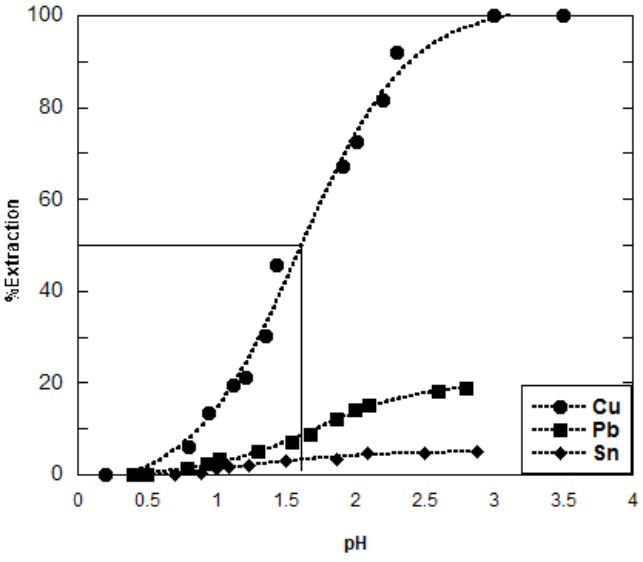

Figure 1. Extraction percentage of Cu, Pb and Sn versus pH, From Fluoroboric acid media with LIX984N 20% (v/v) at 25 °C

In this study, the effect of extractant concentration was investigated. It is concluded that the extraction of copper was increased in high extractant concentration. One of the most important conclusions in this paper is that the copper and lead

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extraction was endothermic process; however extraction rate increases with increasing temperature.

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