

A BATCH-CONTINUOUS HYDROMETALLURGICAL PROCESS FOR THE PRODUCTION OF LME-GRADE COPPER FROM PRINTED CIRCUIT BOARD (PCB) E-WASTE

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ABSTRACT

A detailed study for a fully hydrometallurgical flowsheet was performed for the recovery of copper from pulverized printed circuit boards waste. The pulverization was performed mechanically to obtain an e-waste product at a particle size smaller than 1 mm.

Sulphuric acid at a pH of 1.5 was used as a mineral acid for copper leaching in combination with hydrogen peroxide to accelerate the reaction by maintaining an oxidation-reduction potential at 500 mV. Thereafter, an integrated solvent extraction and electrowinning pilot plant campaign was conducted to produce high-purity copper cathodes from the e-waste bulk leach solution. This consisted of continuous solvent extraction campaigns, in either three or four extraction stages, using LIX984N as an organic extractant diluted in Shellsol A150.

The solvent extraction unit product was continuously fed to an electrowinning cell. High purity copper cathodes were harvested in two stages with a product purity of between 99.994 and 99.998 %. Total respective acid and hydrogen peroxide consumptions of 464 and 498 kg/t were recorded with 76 % copper extraction from PCB samples.

Keywords: E-waste, PCB, Hydrometallurgy, Solvent Extraction, Electrowinning