Electrochemical Selective Leaching and Deposition of Ag, Au and Pt from electronic waste

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In this work, selective electrochemical leaching of compact anodes, made from electronic waste (e-waste) powder containing metals such as silver (Ag), gold (Au) and platinum (Pt), was studied in presence of copper (Cu), nickel (Ni), Tin (Sn) and zinc (Zn), as well as metal selective deposition from solutions generated during electrochemical leaching. Thermodynamic analysis, potentiodynamic polarization and potentiostatic techniques were used to establish the conditions that promote selective leaching and deposit of Ag, Au and Pt in 10% HNO₃. X-ray diffraction (XRD), scanning electron microscopy (SEM) and inductively coupled plasma (ICP) spectroscopy were used to validate the results. Findings showed that selective electrochemical leaching for precious metals (Ag, Au and Pt) was possible at potential ranges between 1.1 to 1.17 V vs. SCE. Leaching was favored by the formation of metallic oxides (i.e., NiO₂, Cu₂O and SnO), which limits the leaching of interfering elements that are present in high concentrations in the e-waste, such as Cu. It is also indicated that four regions of deposit were found using the leaching solution from e-waste, where selectivity zones of precious metals deposit was found in region I (from -0.2V to -0.21V vs. SCE) and region II (at -0.25V vs. SCE). While region III and IV (above -0.3V), copper is the predominant species that produces more uniform and shining deposits.

Keywords: Electrochemical leaching, selective deposit, e-waste, Pt, Au, Ag and Cu.

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