

Critical Assessment of Cobalt (Co) and Copper (Cu) Extraction from Co-Cu Complex Ores

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Abstract

The growing demand of cobalt has been influenced by the transition to a fourth industrial revolution which requires the use of smartphones, laptops, and electric cars. Cobalt (Co) and copper (Cu) are crucial components in the manufacturing of electronic devices. These metals are commonly extracted using hydrometallurgical techniques through leaching in acidic mediums. The Leach/Solvent extraction/Electrowinning process route is commonly used in the extraction of Cu and Co from complex ores. Atmospheric weathering, metamorphic and sedimentary changes undergone by sulphide minerals led to the formation of Cu and Co oxide mineral deposits. The mixture of oxide-sulphide minerals forms complex ores in addition to either oxides mixes or sulphide mixes. The depletion of surface-rich minerals has led to mining of deep ores with 70% oxidized minerals and 30% sulphide minerals. This paper gives a critical assessment of the extraction of Cu and Co from complex ores. A qualitative research methodology was used in scrutinizing literature from 2010 to 2020. While heterogenite ($\text{CoO}\cdot\text{OH}$), chrysocolla ($\text{Cu}_2\text{H}_2\text{Si}_2\text{O}_5(\text{OH})_4$), malachite ($\text{Cu}_2\text{CO}_3(\text{OH})_2$) and pseudomalachite ($\text{Cu}_5(\text{PO}_4)_2(\text{OH})_4$) were the Co and Cu ores found in the literature, this paper will also elaborate on Co and Cu extraction from mixed oxides, mixed sulphides and mixed oxide-sulphide Co and Cu ores as the metals are finally recovered from their aqueous solution using LIX 63, LIX 64 and LIX 65 prior to their specific electrowinning.

Keywords

Extraction, Copper, cobalt, complex ores, and critical assessment