



# Efficient Copper Extraction from Industrial Dilute Solutions Using Air-Assisted Solvent Extraction

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## ABSTRACT

The growing demand for valuable metals in recent decades has heightened the economic significance of extracting them from dilute solutions. This research carefully assesses the extraction efficiency of the air-assisted solvent extraction (AASX) process for effectively recovering copper from industrial dilute solutions, such as the raffinate of the solvent extraction (SX) plant and heap leach solutions. The results clearly showed that increasing the frother dosage to 50 mg/L improved the Cu extraction from 83.5% to 90.2%, but increasing the frother dosage beyond 50 mg/L did not change this response significantly. Although varying the extractant concentration and silicone oil dosage in the studied range did not affect Cu extraction, it noticeably led to an increase in the barrier metals recovery. Furthermore, a nine-step AASX system was applied to comprehensively evaluate the extraction efficiency of Cu from dilute heap leach solution. Moreover, an impressive 95.1% of Cu recovery (from a solution containing 890 mg/L Cu, 12.32 g/L Fe, 2.64 g/L Zn, and 4.1 g/L Mn) was achieved with selectivity ratios of 149.6, 153.0, and 93.5, for Cu/Fe, Cu/Zn, Cu/Mn, respectively. It could be concluded that the AASX process is an efficient and promising method for extracting Cu from industrial dilute solutions derived from secondary resources, low-grade ores, and acid mine drainages.

## KEYWORDS

Solvent extraction; pregnant leach solutions; dilute solutions; metal recovery; hydrometallurgy; raffinate solutions

