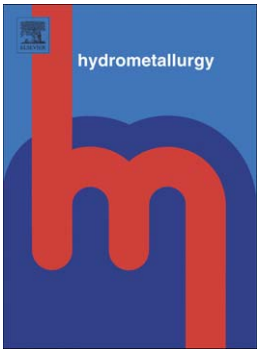

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PII: S0304-386X(16)30078-0
DOI: doi: 10.1016/j.hydromet.2016.03.002
Reference: HYDROM 4308

To appear in: *Hydrometallurgy*

Received date: 26 November 2015
Revised date: 12 February 2016
Accepted date: 4 March 2016

Please cite this article as: Ehsani, Arman, Yazici, Ersin Y., Deveci, Haci, Influence of polyoxometallates as additive on electro-winning of copper, *Hydrometallurgy* (2016), doi: 10.1016/j.hydromet.2016.03.002

Influence of Polyoxometallates as Additive on Electro-winning of Copper

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ABSTRACT

In this paper, the electro-winning of copper from synthetic copper sulphate solutions and the pregnant leach solution (PLS) derived from the leaching of e-waste was investigated in an attempt to reduce energy consumption by using a polyoxometallate (POM), ammonium metatungstate hydrate (AMTH) as a novel additive. Effect of addition of AMTH on the current efficiency, rate of copper deposition, deposit quality and morphology was studied. The current efficiency was determined to be 12% lower in the electro-winning of copper from the pregnant leach solution than that from the synthetic solution (84% *vs* 93%) presumably due to the presence of impurities (e.g. Fe) in the former. The addition of AMTH (50-100-200 mg/L) into the synthetic electrolyte solution was found to increase the current efficiency (by 3-8%) as well as the rate of copper deposition at the current densities tested (150-250-300 A/m^2). Effect of AMTH on the surface morphology of copper deposit was also examined. Despite its beneficial effect on the current efficiency and rate of copper deposition, the deposit morphology tends to deteriorate (i.e. rough/dendritic texture) with increasing the concentration of AMTH in both PLS and synthetic copper sulphate solution. It can be inferred from the findings that AMTH can be used as an additive for reducing power consumption in electro-winning of copper from sulphate solutions.

Keywords: *Electro-winning, Electrolysis, Polyoxometallate, Copper, E-waste, Leaching.*