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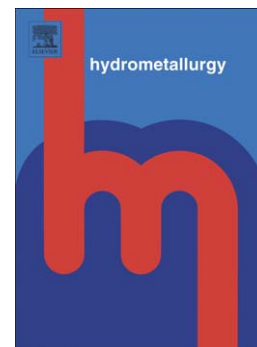
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A PHENOMENOLOGICAL STUDY OF THE ELECTRO-ASSISTED REDUCTIVE LEACHING OF CHALCOPYRITE

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ABSTRACT

Chalcopyrite can be electro-reduced in acid media to less refractory mineral phases such as chalcocite and metallic copper. This paper presents the effect of current density, pulp density, acidity, flow of oxygen and agitation on the chalcopyrite reduction kinetics. The study was complemented with SEM and X-ray characterization techniques in order to understand the phenomena taking place in an electrolytic reactor with anionic separator. The results revealed that when the pulp density is increased (>10 g/L), the main problem of the electro-assisted reduction of chalcopyrite is observed, i.e. chalcopyrite reduction kinetics is considerably hindered. This phenomenon was found to be related to the chemical interaction of the hydrogen sulfide (released during the chalcopyrite reduction) with the oxygen present in the electroleaching system. Elemental sulfur is the product of such chemical interaction, which in the same case as in the conventional oxidative processes, promotes the passivation of chalcopyrite due to the fact that it is a highly non-conductive and hydrophobic species. On the other hand, the electrochemical experiments revealed that chalcopyrite reduction kinetics is dependent on the acidity and agitation rate, showing that chalcopyrite reduction is controlled by the diffusion of protons in the solid-liquid interface. The solid residue characterization revealed that the metallic copper species (product of the chalcopyrite reduction), is very reactive with air (after filtering), producing copper oxide or copper sulfate with and without rinsing, respectively. These results were corroborated by electrochemical techniques, EDS and X-Ray diffraction.

Key words: Reductive leaching of chalcopyrite; elemental sulfur; passivation; electroleaching.

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