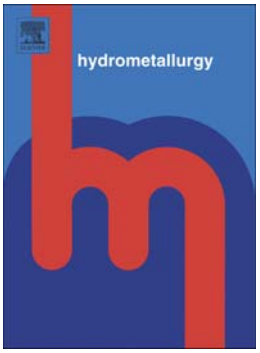

Role of pyrite in sulfuric acid leaching of chalcopyrite: An elimination of polysulfide by controlling redox potential

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Role of pyrite in sulfuric acid leaching of chalcopyrite: An elimination of polysulfide by controlling redox potential

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Abstract: In this study, the role of pyrite in sulfuric acid leaching of chalcopyrite ($CuFeS_2$) was investigated by leaching experiments, X-ray photoelectron spectroscopy (XPS) and electrochemical measurements. The leaching experiments showed that the addition of pyrite remarkably promoted chalcopyrite dissolution by controlling the redox potential over an appropriate range. XPS analysis revealed that the presence of pyrite (FeS_2) significantly promoted the formation of elemental sulfur (S^0) from less than 5% to more than 10% on the mineral surface and almost completely inhibited the formation of polysulfide (S_n^{2-}). Electrochemical measurements further verified that the addition of pyrite inhibited the oxidation of chalcopyrite to polysulfide. Therefore, the pyrite-promoted chalcopyrite dissolution in sulfuric acid was not primarily due to the galvanic effect. In sulfuric acid leaching of chalcopyrite, polysulfide rather than elemental sulfur was the primary cause of passivation. The addition of pyrite primarily controlled the redox potential over an optimum range in which the formation of polysulfide on the mineral surface was inhibited, resulting in higher copper extraction.

Keywords: Chalcopyrite; pyrite; redox potential; passivation

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