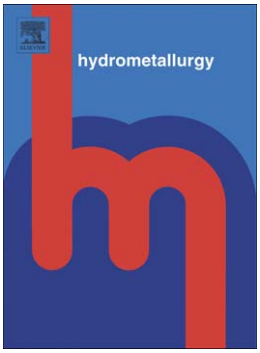

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Leaching and Electrochemical Dissolution of Gold in the Presence of Iron Oxide Minerals Associated with Roasted Gold Ore

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Abstract

This study investigates the electrochemical interactions between gold and roasted gold ore (RGO) with its associated oxide minerals as slurry, in an electrolyte saturated with atmospheric oxygen. Conventional cyanidation showed a decrease of ~ 40% in gold leach rate was obtained with magnetite slurry, while 25% and 10% increases were observed for hematite and maghemite, respectively. These leach rates of gold were considered by applying cathodic Tafel slopes only. SEM-EDS, in case of magnetite slurry, observed high accumulation of iron oxides on gold surface, which is an indication of slowdown in gold leach rate. In the case of roasted gold ore slurry, less amounts of iron oxides were detected with the association of calcium-magnesium coating. XPS results showed also very small amount of gold in slurry of magnetite particles after leaching, i.e. suggesting the adsorption of gold by magnetite, which also justifies its slowdown in gold leach rate. Magnetic separation tests of cyanidation tailings containing 20% of Au resulted in 4% (mass-pull) magnetic concentrate sample having 72% of non-leached Au. Roasted gold ore, magnetic tailings, and synthetic maghemite electrodes showed a cathodic peak, suggesting the reduction of ferric to ferrous ions that could be responsible for the slowdown of leach kinetics, whereas magnetic concentrate did not. Furthermore, when oxygen was bubbled, this peak was disappeared in case of roasted gold ore and synthetic maghemite, however magnetic tailings was still showing the peak.

Keywords: Gold, Roasted Gold Ore, Magnetite, Hematite, Maghemite, Passivation, Electrochemical dissolution

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