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Ahmet Deniz Bas, Edward Ghali, Yeonuk Choi

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A review on electrochemical dissolution and passivation of gold during cyanidation in presence of sulphides and oxides

Ahmet Deniz Bas[1*], Edward Ghali[1], Yeonuk Choi[2]

[1]Department of Mining, Metallurgical and Materials Engineering, Laval University, Quebec, Canada, G1V 0A6

[2]Barrick Gold Corporation, Suite 3700, 161 Bay Street P.O. Box 212, Toronto, Ontario, Canada, M5J 2S1

Abstract

With the rapid depletion of free-milling types of gold ores, sulphidic gold ores are often oxidized prior to cyanidation due to the refractoriness. This results in the increase in the processing of oxidized gold ores. Thus, evaluation of the electrochemical dissolution of more complex and oxidized gold ores become ever important for the mining industry and for R&D. In this study, past achievements and recent developments in terms of electrochemical methods used in gold dissolution and passivation studies of pure gold, sulphidic, and oxidized gold ores are presented.

At potentials close to open circuit potential (OCP) as in practice, slowdown in the dissolution rate of gold could be due to passivation by either adsorbed layers or surface products, or combinations thereof. Different terms such as passivation, inhibition, retarding effect, and slowdown used in gold dissolution studies have been discussed. The developments in electrochemical approaches, such as two separate containers, have been summarized. Conventional electrochemical as well as recent methods, such as electrochemical noise measurement with its in-situ detection of corrosion rate, and scanning reference electrode technique are evaluated.

In the majority of the previous polarization studies, anodic reaction was examined in absence of oxygen whereas cathodic reaction in absence of cyanide, separately, and the dissolution was considered as the intersection of both curves. However, some recent findings report that this does not represent the actual gold dissolution rate as in practice. Additionally, the direction of scanning in cathodic polarization tests, either OCP to cathodic potentials or cathodic potential to OCP, is also reported.

Keywords: Gold, Electrochemical dissolution, Inhibition, Passivation, Oxidized and Roasted Gold Ores

*Corresponding author: Ahmet Deniz Bas (Ph.D. Candidate)
Department of Mining, Metallurgical and Materials Engineering, Laval University, Quebec, Canada, G1V 0A6, Tel: 418-656-8657, Fax: 418-656-5343
ahmet-deniz.bas.1@ulaval.ca