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Semi-pilot biooxidation of refractory sulfide-gold ore using Ferroplasma aciduphilum: D-(+)-Sucrose as booster in columns study

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Microorganism's attachment to surfaces of ore sample is a key factor that influence the biooxidation in pretreatment for recovery of gold in sulfide-bearing ores. In this research, the implementation of D-(+)-Sucrose on the biooxidation of ore sample was studied in a semi-pilot experiment. The experiments were carried out in five separate jacketed columns (1 m height and 6 cm diameter) at constant temperature of 37.5 ℃ and saturated humidity. The air flow rate and recycling solution flow rate were studied in the research and the optimum operating condition were reported. The ore sample (0.49 ppm gold grade) were obtained from Hammond Reef mine site containing 15 wt.% of pyrite which included 98% of gold according to the results of micrograph images. The experiments were continued up to 100 days while air flow rates were chosen to be 0.5, 1, 1.5, 2, and 3 lit/min and the recycling solution (Containing 9K media and 0.4 wt.% D-(+)-Sucrose) flow rates were kept 5, 8, 15 ml/hr. The results indicated that addition of D-(+)-sucrose increased the bacterial activity due to the overproduction of Extracellular Polymeric Substance (EPS) up to 95% and for the condition that the recycling solution and air flow rate were chosen to be 8 ml/hr and 2 lit/min, respectively, the maximum pyrite dissolution of 76% was obtained after passing 60 days. The results indicated that for the air flow rates of 0.5, 1, 1.5, 2, and 3 lit/min the ratio of daily pyrite dissolution per daily solution lost were found to be 0.025, 0.033, 0.031, 0.043, and 0.009 %pyrite dissolution/mllost. The results also indicated that for the condition where the aeration rate was fixed and 3 lit/min and the solution flow rate was on 8 ml/hr, the maximum pyrite dissolution of 61% is achieved after passing 100 days while for the aeration rate of 0.5 lit/min the ultimate pyrite dissolution was 20%.