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ABSTRACT

The use of oxygen is a well-known practice in high-temperature bioleaching reactors whereas air is usually preferred in medium and low-temperatureoperations due to economic constraints. Under high-sulphide loading conditions, as is the case with high-grade metalsulphide concentrates, the microbial and chemical demand for oxygen is significantly increased during thebioleaching process, which requires the injection of large amounts of air and thus increases the energy costs of the process.Sparging with oxygen enriched gas instead of air may offer an interesting alternative process option to improve gas transfer in the bioleaching reactor and to provide an adequate oxygen supply in order to satisfy the oxygen demand. However the use of such conditions can lead to much higher DO concentrations than those encountered with air sparging. Very few papers have been devoted to the study of the optimal range of DO concentrations for bioleaching processes. However most of them reported an inhibitory effect of DO concentrationsabove 5 mg.L^{-1}. The purpose of this study was to investigate the influence of DO on the bioleaching efficiencyunder oxygen-enriched atmosphere in 20Lstirred tank reactor at 40°C. Bioleaching experiments were performed in continuous modewith a sulfide-rich tailings wastes(pyrite 60%, copper 0.8%, cobalt 0.06 %, gold 1 g/t) using the "BRGM-KCC" bacterial consortia.The solid load was closed to 20% (w/w) and the composition of the gas injected in the reactor was: O_2 55%, CO_2: 1%, N_2: 44%. The DO concentration in the reactor was varied between 2 and 15 mg/L by increasing the gas flow. The results obtained show a good bacterial oxidizing activity (ratio FeIII/FeII around 1000). No inhibitory effect of the DO was observed and the sulfide dissolution yield was around 70% for a residence time of 2.3 days.

Key-words: bioleaching, oxygen, DO concentration, sulphide