Effects of Fe^{3+} and Ag^+ on Column Bioleaching of a Low-grade Sulfide Copper Ore

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Due to the consumption of high-grade ores and the increasing demand for copper, the utilization of low-grade copper-bearing ores has become a prominent area of research. In this study, column bioleaching was adopted to separate low-grade copper ore. The effects of Fe^{3+} and Ag^+ on the electrochemical characteristics and column bioleaching of the ore were investigated. The bioleaching ratio and bioleaching rate, as well as the changes to the pH and the redox potential under the effect of Fe^{3+} and Ag^+ were explored. The morphology and phase differences of the leaching residues were compared by XRD patterns and SEM-EDS images, respectively. The results showed Fe^{3+} could enhance the bioleaching of the ore at an optimal concentration of $0.06 \text{ mol} \cdot \text{L}^{-1}$. The Fe^{3+} concentration of the leaching solution in bioleaching with Ag^+ was higher than that without Ag^+ . Ag^+ could improve both the bioleaching ratio and the bioleaching rate of the Cu^{2+} . Leaching residues with rougher surfaces could be obtained with Ag^+ . Fe^{3+} was one of the important elements for the redox action in leaching solution. The enhanced extraction of Cu in the presence of Fe^{3+} caused the formation of minerals with high iron content.

Keywords: Low-grade copper ore; Bioleaching; Fe^{3+} concentration; Ag^+ ; Redox potential.

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