The bioleaching effect of agitation speed on low-grade chalcopyrite ore under the combined catalysis

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Chalcopyrite is the most important copper mineral. It is, however, relatively recalcitrant to chemical and bacterial oxidation because of its special crystal structure and electrochemistry in contrast to many other copper minerals. It is essential to find some desirable methods to enhance chalcopyrite bioleaching. The purpose of this work is to study the bioleaching of agitation speed on low-grade chalcopyrite ore under the combined catalysis

The low-grade chalcopyrite ore used in this study was obtained from Yongping Copper Mine, SE-China. The particle size was less than 5 mm. The chemical composition is as follows: 0.40% Cu, 14.12% Fe, 13% S. The chemical phase analysis showed that chalcopyrite is 0.38% and the other copper minerals 0.02%. The mixed *Acidithiobacillus ferrooxidans* and *Acidithiobacillus thiooxidans* used in this study were isolated from acid mine drainage at Yongping Copper Mine. Leaching experiments were carried out in 10 L plastic drum with 800 ml 9K + S medium without Fe^{2+}, 200 ml inoculation, 25%(W/V) pulp density, 3.0 g/L activated carbon, 2.0 mg/L Ag^{+}, 8.0 g/L Fe^{2+} and 1.20 pH (the pH values were controlled within 1.50 with sulphuric acid during the bioleaching processes). The agitation speeds were 120, 150, 180, 240 and 300 rpm ,respectively.

The results show that the agitation speed has a great effect on the bioleaching of low-grade chalcopyrite ore under combined catalysis of activated carbon, Ag^{+} and Fe^{2+}. The agitating speed of 300 rpm is most beneficial to the dissolution of copper, in this case, the leaching rate of copper reaches 84% after 456 h leaching, which is 37% higher than that at 120 rpm. It is found that it is more favorable to the bioleaching of low-grade chalcopyrite ore if the redox potential is controlled at 580-620 mV.

Variation of hydro-chemistry in lower reaches of the Chinese Golmud-river and its effects on the groundwater

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Major chemical compositions of Golmud-River in Qinghai, China have been measured in order to understand the spatial changeable characteristics and uncover their formation mechanism. In the lower reaches, the river is divided into two dominate tributaries of west river and east river. The principal chemical compositions of Golmud-River change significantly after it flows into alluvial-pluvial fan through Golmud city. With respect to the upper reaches, the chemical composition of west river changes slightly while the TDS of the east river increases greatly with an average of 1566.028 mg/L and reaches to a peak value of 2956.160mg/L in the same geological features. In order to figure out this abnormal variation, hydrological characteristics of the two rivers are researched. TDS of West River varies from 360.061 mg/L in the upper reaches to 552.166 mg/L in the lower reaches. Such characteristic indicates that chemical compositions of West River are principally dominated by dissolution of weathered chemical components along the river course. In contrast, the sharp rise of TDS of east river could arise owing to fluctuations of groundwater table which is about 1~3m and higher than groundwater critical evaporation depth. Moreover, groundwater table has been rising with the ascending of water leakage since the completion of hydropower station in upper reaches. Consequently, a large amount of salts are carried upward to the surface and greatly accumulated under strong evaporation. Hence, a conclusion can be drawn that significant high salinity of East River originates from soil salinization which is due to groundwater table ascending and strong evaporation.