The bioleaching of low-grade chalcopyrite ore in the presence of activated carbon

W.M. ZHANG[1,2]* AND Z.X. SUN[1,2]

[1]School of Civil and Environmental Engineering, East China Institute of Technology, Fuzhou 344000, China (*correspondence: wmzhang@ecit.edu.cn)

[2]Key Laboratory of Nuclear Resources and Environment of Ministry of Education, East China Institute of Technology, Nanchang 330013, China

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 effect of activated carbon on bioleaching of low-grade chalcopyrite ore.

The low-grade chalcopyrite ore used in this study was obtained from Yongping Copper Mine, SE-China. The particle size was less than 5mm. 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 250 mL elenmeryer flasks with 80ml 9K + S medium without Fe^{2+} and 20ml inoculation at initial pH 1.20 (pH values were controlled within 1.50 during the bioleaching) and 25%(W/V) pulp density. The flasks were incubated in a rotary shaker at 130 rpm and 30°C.

The activated carbon can greatly enhance the copper dissolution during the bioleaching of low-grade chalcopyrite ore. The solution with a concentration of 3.0 g /L activated carbon is most beneficial to the dissolution of copper, whose recovery is increased from 11% to 79% after 600 hour bioleaching, being 68% higher in the presence of activated carbon than that in the absence of activated carbon. The enhanced copper dissolution can be attributed to the galvanic interaction between activated carbon and chalcopyrite. The lower redox potentials are more favorable to the copper dissolution than the higher redox potentials for low-grade chalcopyrite ore in the presence of activated carbon.

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Paleogeothermal field in Dongsheng area, Ordos Basin

WEN ZHANG* AND BAI GAO

East China Institute of Technology, Fuzhou, Jiangxi, 344000, China (*correspondence: wzhang@ecit.edu.cn)

Background

Geothermal gradientwas low in Paleozoic and Early Mesozoic in Dongsheng area, Yimeng uplift resulting in a low level of thermal evolution of source rocks, and it increased up to 3.3□/100m in Late Mesozoic.The Late Mesozoic tectonic thermal events and the later continuous uplifting in Dongsheng area would have resulted in the active movement of thermal fluid [1]. The paleogeothermal field in Dongsheng area, NW-China, is disscussed based on vitrinite data in the paper.

Palaeogeothermal Simulation Parameters

The main parameters used in the simulation are lithologic, stratigraphic geological parameters and vitrinite reflectance. The lithological parameters come from the average values of the corresponding parts of the measured data of the basin, and the stratigraphic geological parameters are selected from Drill ZKB19-72.

Calculation of Denudation Thickness

The homogeneous temperature of mineral inclusions taken from sandstone of the Zhiluo Formation in the area ranges from 75.6°C to 148.9°C, an average is 116.9°C. By the relationship between geotemperature and burial depth. The denudation thickness is identified as 900m to 1200m.

Stratigraphic Burial History

Thermodel for Windows 2004 [2] is applied to simulate the erosion depth and the buried history of strata in the area by different simulators. The simulation results show that the strata formation had been in sedimentation from 160ma ago to 130Ma ago, in standstill stage from 130ma ago to 105Ma ago, and has been in rising since 105Ma ago. In this inversion simulation, the thickness of stratigraphic erosion of the basin is relatively small, around 1100m.

Geothermal History

The reconstruction of geothermal history [3] of Ore-bearing strata indicates that the strata suffered the maximum temperature of 86°C and the geothermal gradient of 51 ℃/ km.

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[1] Hu S B *et al*. (2001) *Chinese J.Geophys*. **44**(5): 611~626. [2] SUN Z X *et al*. (2005) *Chinese Science Bulltin*, **50**S□93□98. [3] Sun Z X *et al*. (2006), *Chinese J.Geophys.* **49**(1): 123-128.