

Oxidization of chalcopyrite Mediated by *Acidithiobacillus ferrooxidans* and secondary minerals

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Chalcopyrite is one of the most abundant copper mineral. The microbial oxidization of chalcopyrite in mining wastes is an important pathway for the release of heavy metals into surrounding environments. We performed an bath experiment to disclose the mechanism of chalcopyrite- *Acidithiobacillus ferrooxidans* in this study.

A strain of *Acidithiobacillus ferrooxidans* isolated from acid mine drainage of Shizishan Cu-Au mineral deposit, eastern China, was used to interact with hand-selected chalcopyrite particles from sulfide ores in this study. *A. ferrooxidans* were inoculated into three flasks each contains 300 mL sterilized 9K culture with 17 mM Fe²⁺. Other flasks with same volumetric 9K culture were control groups without inoculation. After reacting for 5 days, 10 days and 20 days, samples were extracted and lyophilized for SEM observation and spectral analysis (FTIR, XRD, Raman and XPS). STXM coupled with NEXAFS analyzed the distribution of Fe and Cu in/on the cell. As for the reacted solution, ICP-OES was employed to determine the concentrations of Cu and Fe, while Ion Chromatography (IC) to measure the contents of S₂O₃²⁻, SO₃²⁻ and SO₄²⁻.

The results reveal the enhancement of oxidation of chalcopyrite by microbial mediation. Surface etching attributed to the adhesion of the cells on chalcopyrite results in various pits on chalcopyrite surface. Jarosite and elemental sulfur were identified as main secondary minerals. The concentration of Cu in solution increased in the beginning reaction days and decreased a little subsequently because of adsorption onto and coprecipitation into Fe(III) sulfate minerals. Base on the depth profiles of XPS analysis of reacted chalcopyrite particles, detailed information of oxidization processes of Cu, Fe and S can be acquired. From the surface to the depth, the content of Fe(III) decreases and Fe(II) increases. S was presented as sulfate and sulfur in the surface, and contents of reduced states increase in the deep. According the variation of their chemical states, the chemical mechanism behind the microbial oxidation was discussed, which will highlight the study on bioleaching technology for the processing of low-grade copper sulfide ores.

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Control of gypsum-salt rock on source rock and reservoir in the Dongpu depression of Bohai gulf basin, eastern China

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Source rocks and gypsum-salt rocks of Dongpu depression distribute alternately in vertical, overlay in horizontal, which have a symbiotic relationship[1,2]. The source rocks in gypsum-salt and sand-shale transition zone have the highest organic matter abundance, and the nearer the distance from gypsum-salt rocks, the higher organic matter abundance the source rocks have. Organic matter types of source rocks in gypsum-salt zone and transition zone are mainly typeI and type III Kerogen, while that in sand-shale zone are mainly type II1 and typeII2 Kerogen. For the role of high thermal conductivity of gypsum-salt rocks, source rocks in the upper part of which has shallower threshold depth for oil generation, and that in lower part has deeper threshold depth, that effectively expand the scope of the hydrocarbon generation window.

Sandstone in Dongpu depression is interfingered with gypsum-salt rocks in space[1]. By the compactness and high thermal conductivity of gypsum-salt rocks, the porosity of sandstone in the lower part of gypsum-salt rocks has larger porosity than normal sediment stratum. By the carbonate cementation and gypsum and salt rock grain infiltration, the porosity of sandstone in the lower part of gypsum-salt rocks performs first increases and then decreases with increasing depth, and the maximum porosity appears within a certain distance in the lower part of the gypsum-salt rocks..

[1] Du Haifeng, *et al.* (2008) *Journal of Palaeogeography*, 1,53-62. [2] Wang Dongxu, *et al.* (2005) *Natural Gas Geoscience*,3,329-333.