Inhibition of Microbial Pyrite Oxidation by PropS-SH for the Control of Acid Mine Drainage

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Acidithiobacillus ferrooxidans, an acidophilic sulfur and iron-oxidizing microorganism, plays an important role in the oxidation of FeS₂ and the formation of acid mine drainage (AMD). In this study, the stability of γ -mercaptopropyltrimethoxysilane (PropS-SH) treated pyrite in the presence of *Acidithiobacillus ferrooxidans* was investigated by electrochemical techniques in conjunction with bioleaching approach. In addition, the chemical and morphological characteristics of pyrite before and after coated by PropS-SH were analyzed with X-ray photoelectron spectrometer (XPS) and contact angle tests. The results from electrochemical tests indicated that the coating of PropS-SH significantly decreased electrochemical activity of pyrite in bioleaching solutions. The results of bioleaching experiments showed that PropS-SH coating could effectively suppress the release of S and Fe species from pyrite and inhibit the growth of bacteria. These results were attributed to the formation of a hydrophobic layer on pyrite surface by chemisorption of PropS-SH which could limit the contact of bacteria with pyrite.

Keywords: pyrite; Acid mine drainage; inhibition; *Acidithiobacillus ferrooxidans*; γ -mercaptopropyltrimethoxysilane (PropS-SH); Electrochemical technique.

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