Adsorption of biosolids and their main components on chalcopyrite, molybdenite and pyrite: Zeta potential and FTIR spectroscopy studies

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Abstract

Zeta potential measurements were used to assess the electrokinetic characteristics of chalcopyrite, molybdenite and pyrite in the presence of biosolids and their main components (humic acids, glucose and serum albumin) as well as a commercial collector (Aero 6697). Fourier transform infrared spectroscopy (FTIR) was then used to gain a deeper understanding of the interaction of these compounds with these sulfide minerals. It aims to achieve a better understanding of the surface chemistry of sulfide-water interfaces that improve froth flotation at industrial scale in the step of copper sulfide ore concentration. Zeta potential results show that hydrogen and hydroxide ions are potential determining ions for each sulfide mineral studied. The addition of 50 g/t biosolids or all the other chemicals used in this investigation shift the isoelectric point of chalcopyrite. Under the same conditions, only humic acid significantly affects the zeta potential of molybdenite, making it more negative in the pH range investigated, and shifting its isoelectric point about 6 pH units. These compounds seem to have a poor affinity with pyrite surfaces because their zeta potential is slightly modified. FTIR spectroscopy characterization shows that biosolids and their main components can interact with chalcopyrite, molydenite and pyrite surfaces through a complex mechanism involving chemical or physical linkages. The results reported here seem to indicate that biosolids may be used as new environment-friendly froth flotation agents to concentrate copper and molybdenum sulfide minerals.

Keywords

Author Keywords: Chalcopyrite; Molybdenite; Zeta potential; Biosolids; Humic acids

KeyWords Plus: ACTIVATED-SLUDGE; ORGANIC-MATTER; SULFIDE ORES; FLOTATION; MINERALS; INTERFACES; SEPARATION