Effect of biosolids and their main components in the concentration of copper sulphide ores

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Abstract

The copper mining industry in Chile and perhaps in other countries as well is faced with the challenge to implement the best practices in order to achieve a sustainable and more environmentfriendly growth. Relationships between mining industry and society have been historically complex due to its environmental impacts. Whereas the ore grade has declined continuously, this has involved an intensive energy and water consumption thus increasing operational costs at different stages of the concentration process. In the case of copper sulphide ore concentration, froth flotation is the main technology used worldwide. The amount of the different chemical reagents used in flotation plants (i.e., collectors, depressants, frothers and modifiers) affects significantly production costs and has a negative effect on the environment as well. The objective of this research work was to evaluate the use of biosolids and their main components (i.e., glucose, proteins and humic substances) as more environment-friendly flotation collectors for chalcopyrite and molybdenite. For this purpose, microflotation tests were conducted in a modified Hallimond tube. In addition, FTIR and zeta potential experiments were performed to investigate the interaction of biosolids with these sulphide minerals. Biosolids and their main components may interact through physical and chemical ways due to different affinities with such sulphide minerals as chalcopyrite, pyrite and molybdenite, which are present in copper sulphide ores. In alkaline pHs, biosolids and their main components make the zeta potential of the sulphide minerals investigated more negative. These results may provide important information concerning the behavior of the main sulphide minerals in the concentration of copper sulphide ores at industrial scale, wherein mill processes could affect their surfaces properties. Therefore, biosolids and their main components may open an opportunity to be used in copper sulphide flotation plants to partially replace conventional reagents, which are more hazardous and less environment-friendly.

Keywords:

- Biomineral processing
- Copper
- Flotation chemistry