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Enhancing the Flotation of Fine and Ultrafine Pyrite Particles Using Electrolytically Generated Bubbles

Authors : Bogale Tadesse, Krutik Parikh, Ndagha Mkandawire, Boris Albijanic, Nimal Subasinghe

Abstract : It is well established that the floatability and selectivity of mineral particles are highly dependent on the particle size. Generally, a particle size of 10 micron is considered as the critical size below which both flotation selectivity and recovery decline sharply. It is widely accepted that the majority of ultrafine particles, including highly liberated valuable minerals, will be lost in tailings during a conventional flotation process. This is highly undesirable particularly in the processing of finely disseminated complex and refractory ores where there is a requirement for fine grinding in order to liberate the valuable minerals. In addition, the continuing decline in ore grade worldwide necessitates intensive processing of low grade mineral deposits. Recent advances in comminution allow the economic grinding of particles down to 10 micron sizes to enhance the probability of liberating locked minerals from low grade ores. Thus, it is timely that the flotation of fine and ultrafine particles is improved in order to reduce the amount of valuable minerals lost as slimes. It is believed that the use of fine bubbles in flotation increases the bubble-particle collision efficiency and hence the flotation performance. Electroflotation, where bubbles are generated by the electrolytic breakdown of water to produce oxygen and hydrogen gases, leads to the formation of extremely finely dispersed gas bubbles with dimensions varying from 5 to 95 micron. The sizes of bubbles generated by this method are significantly smaller than those found in conventional flotation (> 600 micron). In this study, microbubbles generated by electrolysis of water were injected into a bench top flotation cell to assess the performance electroflotation in enhancing the flotation of fine and ultrafine pyrite particles of sizes ranging from 5 to 53 micron. The design of the cell and the results from optimization of the process variables such as current density, pH, percent solid and particle size will be presented at this conference.

Keywords : electroflotation, fine bubbles, pyrite, ultrafine particles
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