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Effect of Sodium Metabisulfite Depressant on Chalcopyrite Recovery in Hydrofloat™ Flotation.

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ABSTRACT

Achieving effective separation of pyrite from copper minerals during flotation is often hindered by challenges such as superficial oxidation and the presence of fine intergrowths between pyrite and copper sulfides. These conditions can result in the unintended activation of pyrite by dissolved copper ions, leading to decreased product quality. Sodium metabisulfite (SMBS) is commonly used in flotation circuits to depress pyrite and enhance the selectivity for chalcopyrite recovery. However, its impact on downstream processes like HydroFloat flotation, particularly when targeting chalcopyrite composites and both liberated and semi-liberated copper in rougher tails, has not been extensively studied. This study evaluates the effect of SMBS addition at different stages of the circuit including in the ball and SAG mills on the selective recovery of chalcopyrite and directly to rougher flotation tailings before HydroFloat flotation. Laboratory-scale flotation experiments were conducted under three conditions: no SMBS, SMBS added within the circuit, and SMBS added to fresh rougher flotation tailings. The results indicate that while SMBS effectively depresses pyrite, its influence on chalcopyrite recovery is dependent on both the dosage and point of addition. "Over-depression" of chalcopyrite was observed under certain conditions, raising concerns about selectivity. This study provides insights into optimizing SMBS application to enhance chalcopyrite recovery while minimizing pyrite contamination in Hydrofloat™ flotation, particularly when applied in tailings scavenger operations.

KEY WORDS

Sodium metabisulfite, chalcopyrite, pyrite, Hydrofloat™ flotation, tailings scavenger, flotation circuit optimization.

BIOGRAPHY

Richel Annan Dadzie is PhD Student in Mineral Resources and Engineering at the University of South Australia, Future Industries Institute. Her research specializes in advanced flotation techniques and fluidised bed flotation of copper ore at fine particle sizes. With two years of hands-on experience as a metallurgist in a gold processing plant, Richel brings practical industry knowledge to her research. Collaborating closely with industry leaders, Richel's work focuses on optimizing mineral processing through innovative methodologies.

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