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Comparative Performance of HydroFloat™ and Denver Cell Flotation on Finer Copper Tailings

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ABSTRACT

Reprocessing sulphide flotation tailings remains challenging due to their complex mineralogy and fine particle size distributions. This study compares the performance of a conventional Denver mechanical cell and the HydroFloat™ fluidised-bed separator on rougher tailings from a copper mine, with a critical size split at 53 µm. Although the HydroFloat™ has been primarily applied to coarser particles, its application at this finer-than-usual threshold is still largely unexplored. Tests were conducted to assess copper recovery and grade across both technologies, complemented by detailed characterisation of the concentrates using mineralogical techniques. The results show clear differences in selectivity and recovery mechanisms: the Denver cell exhibited higher entrainment of fine gangue while the HydroFloat™ maintained selective recovery of copper-bearing composites despite the finer particle size. Concentrate mineralogy further demonstrated that poor liberation strongly limited overall recovery; however, the HydroFloat™ offered a more favourable grade–recovery trade-off within this unconventional size domain. These findings extend the applicability of fluidised-bed flotation to a broader particle size distribution, marking a significant milestone for tailings reprocessing and offering new pathways for maximising value from low-grade resources.

KEY WORDS

HydroFloat™, Denver cell, Fine particle flotation, Copper tailings, Mineralogy, Reprocessing, Fluidised-bed flotation, Entrainment

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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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