Topical Collection

Advances in Fine Particle Flotation: Challenges and Solutions

Message from the Collection Editors

Fine particle flotation presents persistent challenges due to its low collision efficiency, strong surface hydration, and high reagent consumption. These issues hinder the effective recovery of valuable minerals, especially as ore grades decline and fine-grained ores become more prevalent. Recent advances have focused on improving hydrodynamics through high-intensity flotation cells and micro/nanobubble technologies that enhance particle–bubble interactions. Innovations in reagent chemistry, such as selective collectors and polymer modifiers, have improved selectivity and attachment efficiency. Physical pre-treatments like desliming, ultrasound, and agglomeration flotation also show promise. Furthermore, computational tools like CFD-DEM and molecular dynamics offer new insights into microscale mechanisms, while machine learning assists in process optimization. Hybrid approaches are emerging as viable strategies. This collection highlights interdisciplinary solutions aimed at overcoming the intrinsic limitations of fine particle flotation, advancing both the science and practical applications of mineral beneficiation in complex ore systems.

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Minerals welcomes submissions that report basic and applied research in mineralogy. Research areas of traditional interest are mineral deposits, mining, mineral processing and environmental mineralogy. The journal footprint also includes novel uses of elemental and isotopic analyses of minerals for petrology, geochronology and thermochronology, thermobarometry, ore genesis and sedimentary provenance. Contributions are encouraged in emerging research areas such as applications of quantitative mineralogy to the oil and gas, manufacturing, forensic science, climate change, geohazard and health sectors.

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