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Present and future commercial applications of biohydrometallurgy

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Abstract

Modern commercial application of biohydrometallurgy for processing ores became reality in the 1950s with the advent of copper bioleaching at the Kennecott Copper Bingham Mine. Early application entailed dump leaching of low-grade, low-value, run-of-mine material. Dump bioleaching has evolved into a commercially accepted option for bioheap copper leaching of higher-grade, higher value ores. This commercial practice is exemplified by at least 11 mining operations. Paradoxically, application of biohydrometallurgy in the pretreatment of refractory gold ores began with processing high value concentrates, using biooxidation-tank processes and was followed by extension to processing low-grade, lower value ores in heaps. Now, bioleaching has been extended to the commercial extraction and recovery of cobalt. Even with the current success of biohydrometallurgical applications in the mining industry, the real potential of biotechnology in mining remains to be realized. As confidence in commercial

bioprocessing grows and experience extends the application's knowledge base, innovations and new commercial practices will emerge. Near-term future commercial applications will likely remain focused on recoveries of copper, gold and possibly nickel. Recent technical advances show that very refractory chalcopyrite can be successfully bioleached. Processes for copper recovery from this mineral will include both heap and stirred-tank reactors. Next generation technologies for pretreatment of refractory gold ores will be based on use of thermophilic bacteria for sulfide oxidation. For biohydrometallurgy to commercially advance, the microbiologist must work cooperatively with the practitioners of the technology for mutual understanding of operational limitations and practical constraints affecting the microbiological component.



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Keywords

Bioleach; Biooxidation pretreatment; Cobalt; Copper; Gold; Nickel

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