

Biomining for metal extraction from ore and waste

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Abstract

Biomining is applied bioleaching and biooxidation for extracting metals from ore in contrast to acid mine drainage which is uncontrolled and unintentional. Bioleaching is the conversion of an insoluble valuable metal (metal sulfide) into a soluble form (metal sulfate). The recovery of copper from low grade copper ore is the major application of bioleaching today and about 10–15% of the world's copper is recovered by heap bioleaching. Biooxidation is a process in which the recovery of a metal is enhanced by microbial decomposition of the mineral, but the metal being recovered is not solubilized. The major application is the recovery of gold from refractory sulfide ores using large tank biooxidation plants. Biomining of ores is nowadays an established biotechnology. Advances in the construction of plants and heaps, as well as in process design and in the application and monitoring of the metal sulfide oxidizing microorganisms enabled biomining to successfully compete with other metallurgical technologies. Recent R & D has also opened the door for metal extraction from waste materials such as mine tailings. In the case of mine tailings biomining may also provide an option for bioremediation of acid mine drainage generating mine waste.