Microbe-mediated sustainable bio-recovery of gold from low-grade precious solid waste: A microbiological overview

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ABSTRACT

In an era of electronics, recovering the precious metal such as gold from ever increasing piles of electronic-wastes and metal-ion infested soil has become one of the prime concerns for researchers worldwide. Biological mining is an attractive, economical and non-hazardous to recover gold from the low-grade auriferous ore containing waste or soil. This review represents the recent major biological gold retrieval methods used to bio-mine gold. The biomining methods discussed in this review include, bioleaching, bio-oxidation, bio-precipitation, bio-flotation, bio-flocculation, bio-sorption, bio-reduction, bio-electrometallurgical technologies and bioaccumulation. The mechanism of gold biorecovery by microbes is explained in detail to explore its intracellular mechanistic, which help it withstand high concentrations of gold without causing any fatal consequences. Major challenges and future opportunities associated with each method and how they will dictate the fate of gold bio-metallurgy from metal wastes or metal infested soil bioremediation in the coming future are also discussed. With the help of concurrent advancements in high-throughput technologies, the gold bio-exploratory methods will speed up our ways to ensure maximum gold retrieval out of such low-grade ores containing sources, while keeping the gold mining clean and more sustainable.

KEYWORDS

Gold; Critical metals; Bio-recovery; Biomining; Gold harvesting microbes

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