

Partners



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Biotechnology in mining and recycling



Helmholtz Institute Freiberg for Resource Technology



THE BACKGROUND

Energy-efficient and environmentally friendly

Biotechnological processes are an energy-efficient, environmentally friendly and inexpensive way of recovering and recycling important industrial metals and strategic raw materials for high-tech purposes. They are a major topic of research at the Helmholtz Institute Freiberg for Resource Technology (HIF). The methods devised utilize bacteria, other microorganisms and biomolecules. These can bind to mineral surfaces or convert mineral constituents by means of metabolic processes.

The processes are entirely biological. Furthermore, they are superior to conventional methods in one other significant way: many metals are present today in highly complex compounds and in very low concentrations – this is true of natural mineral resources as well as recycled materials. Innovative technologies are needed to extract them. Bio-processes are ideally suited to increasing the quantity and diversity of the resources available.

The researchers at HIF are developing biotechnological methods for the extraction and processing of metals and rare earths from primary and secondary raw materials as well as from scrap.



Bacteria and other microorganisms are capable of extracting metals from ores. Active biological substances can be used to enrich them.

Picture credits: HZDR/ 3D Kosmos (title page), HZDR/ Bierstedt (inside page).

THE GOAL

Bioleaching and bioflotation

Microorganisms can dissolve metals from ore by means of their metabolic processes or products. This is called bioleaching. The researchers at HIF are seeking to apply this technique to European copper ores and at the same time extract valuable by-products. Copper accumulates in considerable quantities in tailings, because mining and subsequent processing leave significant residues. The researchers are also looking into ways of making these valuable substances biotechnologically useful.

The dissolved metals can be biologically filtered out of leaching solutions or industrial water. For this purpose, scientists are developing metal-binding filter materials based on natural complexing agents or specially designed biomolecules.

Instead of living bacteria, active biological substances may also be useful. One example of this is the enrichment of metals by the flotation process. The scientists aim to create an environmentally friendly alternative in which bioactive substances replace or at least reduce the use of chemicals (bioflotation). Such substances are capable of changing mineral surfaces, thereby collecting valuable substances and/or leaving unwanted constituents behind.

Our strengths

// We are carrying out research into innovative, environmentally friendly and economically viable raw material technologies, thereby opening up new fields of technology for the processing and recycling of natural resources.

// We have many years of experience in researching microorganisms and their interactions with metals and in developing applications from this research.

// We have state-of-the-art microbiological and molecular biology laboratories for the entire research chain, from the cultivation of microorganisms and the design of biomolecules right through to the analysis of processes.

Interested in working with us? Get in touch!