

# **Biobleaching, or microbial ore leaching**

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# Bioleaching, or microbial ore leaching

- **Bioleaching, or microbial ore leaching:** is a process used to extract metals from their ores using bacterial micro-organisms.
- The bacteria feed on nutrients in the minerals, causing the metal to separate from its ore.
- The metals commonly extracted using this process include gold, silver, zinc, copper, lead, arsenic, antimony, nickel, molybdenum cobalt, and uranium.
- Bioleaching is performed mostly by iron and sulfide oxidizing bacteria, or acid producing fungus.
- Some of the types of bacteria used in this process include *Leptospirillum ferrooxidans*, *Thiobacillus ferrooxidans*, and some species of *Sulfolobus*, and *Sulfobacillus*.

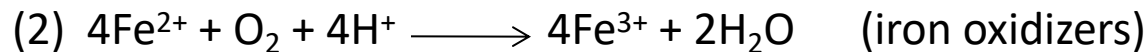
# ...Bioleaching, or microbial ore leaching

- For example, bacteria catalyse the breakdown of the mineral pyrite ( $\text{FeS}_2$ ) by oxidising the sulfur and metal (in this case ferrous iron,  $\text{Fe}^{2+}$ ) using oxygen. This yields soluble products that can be further purified and refined to yield the desired metal.

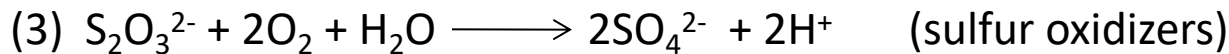
**Pyrite leaching** ( $\text{FeS}_2$ ): In the first step, disulfide is spontaneously oxidized to thiosulfate by ferric ion ( $\text{Fe}^{3+}$ ), which in turn is reduced to give ferrous ion ( $\text{Fe}^{2+}$ ):



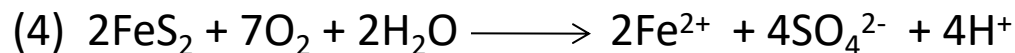
The ferrus ion is then oxidized by bacteria using oxygen:



Thiosulfate is also oxidized by bacteria to give sulfate:



The ferric ion produced in reaction (2) oxidized more sulfide as in reaction (1), closing the cycle and given the net reaction:



The net products of the reaction are soluble ferrous sulfate and sulfuric acid.

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- Using micro-organisms helps to reduce production costs, minimize environmental pollution, compared to conventional leaching processes that use cyanide, and to efficiently extract metals, even when their concentration in the ore is low.
- This process is growing in popularity, as the bacteria can grow naturally in mining environments, and can also be easily cultivated and recycled.

