

## Biomining

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The process of mining is used to meet our demands for metals. It is basically the process of extracting metals from their constituent ores. But with the escalating population and industrialisation, it has become hard to depend exclusively upon the conventional mining methods for metal extraction. In addition, the harm caused by different activities of mining, such as soil and water contamination, erosion, habitat loss, emission of harmful substances into the air has made us realise the importance of an eco-friendly method. Therefore, to overcome these problems there have been constant efforts by scientists to develop new technologies or to think of a substitute. The use of microorganisms turned out to be a good option as it is environment-friendly. This technique of extracting metals of economic interest like gold from its ores using microorganisms is known as biomining. The most common metals that can be biominer are Cu (copper), U (uranium), Ni (nickel) and Au (gold). They are majorly seen in sulphide ore. The application of biomining has been utilised for a long time even though individuals did not know about the association of organisms. The first microorganisms apparently utilised were in the assembly of metals which was given by a Roman author Gaius Plinius Secundus.

In the basic process of biomining, the preferred metals are normally found in a strong structure when a few microorganisms (for example, mesophiles: *Acidithiobacillus*, thermophiles: iron-oxidising bacteria, etc.) are used so that they can effectively oxidise metals and enable them to disintegrate in water. This process can be attained by two different procedures. One is bioleaching, in which the metal is extracted from its constituent ore by the use of microorganisms. In this method, the valuable metal is solubilised. The second is bio-oxidation, which is an oxidation process carried out by the microorganisms where valuable metal remains in the solid phase and the solution is discarded. This method makes the metal more accessible so that the metal is extracted easily from conventional mining techniques. In both procedures, the microbial response occurs at that place where organisms, rocks and basic supplements are accessible. Although these procedures are time-consuming, they are effectively utilised techniques. In this global drive towards a green solution, biomining turned out to be an effective alternative to overcome the ill effects of conventional mining and to extract metal from low-grade ores. But it still has its own set of disadvantages, such as being limited to only a few ores and a time-consuming extraction process. But the advantages overpower the disadvantages thus making it the most suitable technique for now. Therefore, biomining is the best eco-friendly alternative to conventional mining.

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