Bacterial Extraction of Phosphorus from Iron Ore

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Phosphorus is a problem in ironmaking feedstocks, as phosphorus in iron gives the metal undesirable properties. Some iron ore sources have significant levels of phosphate minerals that are difficult to remove, and so use of ore from these sources requires the iron and steel plants to remove the excess phosphorus from the molten metal.

If phosphorus can be removed from the ore at the ore concentrator, the value of the iron ore concentrate can be increased. While phosphate minerals are difficult to separate from iron oxides using conventional physical separation techniques, it is possible that they could be removed by a sufficiently low-cost selective dissolution process.

In this project, microorganisms were used to selectively dissolve phosphate minerals from iron ore. Since microorganisms require phosphorus as a critical nutrient, many of them have developed the ability to dissolve phosphate minerals from ore, and so growth of these organisms on iron ore is expected to be able to solubilize and remove the phosphates.

Experimental “proof of concept’ work was carried out with a variety of microorganisms to determine their phosphorus removal capability. Certain filamentous fungi, which secrete organic acids that dissolve phosphate minerals, were found to be most effective. The method could remove phosphorus, but the currently known organisms have low growth rates, and as a result it requires several weeks for phosphorus to be removed.

If faster-growing organisms can be discovered or developed, this technology has good potential for reducing the phosphorus levels of high-phosphate iron ores.