An eco-friendly method for heavy metal removal from mine tailings

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Mine tailings are left over from the process of separating the valuable fractions from the ores. Their composition is directly dependent on the composition of the ore, and the mineral extraction process used on the ore. High concentrations of heavy metals are found in mine tailings, and they can be major environmental contamination sources, spilling pollution into the surrounding soil, air, and water. Heavy metals from these mine tailings can migrate into rivers and ground water, threatening the health and well-being of inhabitants of even further areas. This stresses the importance of the treatment of mine tailings and the fact that storing these hazardous by-products is not an ideal solution.

During recent decades, numerous methods have been developed for the treatment of soil and water contaminated with heavy metals. One of the environmentally friendly approaches for removing heavy metals from soil is by using an effective, biocompatible, biodegradable surfactant during the process of washing [1].

In the current study, the efficiency of 0.5 % and 1% sophorolipid solutions, in mobilizing chromium, manganese, nickel, copper, zinc, and lead from mine tailings during seven day batch experiments were evaluated. Furthermore, the effect of sophorolipids on different fractions of the mine tailings was investigated. The results of this investigation show that sophorolipids are selective mobilizers. The use of sophorolipids substantially increased the removal of some elements while having no effect on the mobilization of others. In contrast to sophorolipids, deionized (DI) water did not remove any chromium from the mine tailings. When sophorolipid solutions were used instead of DI water, the removal of manganese, copper, and zinc increased by 15, 12.5 and 9 times, correspondingly. On the other hand, there were no increases in the removal of nickel and lead. By studying the results from the sequential extraction, it was determined that the sophorolipid solution made substantial changes in the different fractions of the sample. In conclusion, sophorolipid assisted washing is an effective, economical feasible, and environmentally friendly method for removing heavy metals from contaminated media.

[1] Wang, S., & Mulligan, C. N. (2009). Rhamnolipid biosurfactant-enhanced soil flushing for the removal of arsenic and heavy metals from mine tailings. Process Biochemistry, **44**(3), 296-301.