BIOREMEDIATION OF SOIL IMPACTS BY MINING ACTIVITIES BY MICROBIAL SULFATE REDUCTION

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Mining-metallurgical industry is an important income source for many countries. Unfortunately, mineral extraction operations represent pollution sources that have been associated with environmental receptors alterations that cause health problems in surrounding population. Lead concentrations ranging from 1300 to 2100 mg kg-1 or as high as 7000 mg kg-1, has been reported in surface soils near to copper, lead and zinc foundries. Actually there are mining wastes and smelter slag deposits containing high amounts of lead and heavy metals that have not been reported and therefore their environmental impact also have not been evaluated. Principal stabilization technology is a cost-effective biological treatment, which emphasizes use of sulfate-reducing bacteria (SRB), to produce products with lower solubility compared to other treatment techniques.. In this work, we studied a sample of soil impacted by emissions from a copper smelter and mine wastes, whose Pb concentrations is 5533.3 mg kg-1 that exceeded the allowable limit established in the Mexican law. The biostabilization was developed using a microbial consortium with sulfate-reduction activity previously isolated from soil with a high degree of lead bioaccesible called JH. To evaluate efficiency of this consortium, changes in mineral fractions of Pb speciation (water-soluble, carbonate-bound, iron-manganese-oxide bound, organic matter and sulphide-bound and residual) on three soil profiles a column was packed with this soil in a closed batch system. After biological treatment the soil lead mineralogical speciations and the lead bioaccessible fractions modifications were determined. Tests of soil stabilization showed a Pb removal of 55%, which represent an overall decrease with respect to the bioaccessibility of 27%.

Keywords: bioaccessibility, sulfate-reducing, biostabilization