



DETERMINATION OF THE CONDITIONS OF THE SOIL-WASHING USING EDTA TO LEAD REMOTION

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Introduction. Heavy metals are contaminants normally associated with mining. Among them are the lead, cadmium, copper, and zinc (1). These metals can be removed using soil-washing techniques (2) or removal with chelating agents (3) as the EDTA. These methods reported efficiencies between 54 and 68% of lead-removal. However, some authors reported efficiencies close to 100% (4). In this work we report the results of the removal of Pb from one soil sample from the mine of Real de Catorce, located in San Luis Potosi, Mexico, using different conditions of soil washing with EDTA as chelating agent.

Methods. The soil sample physicochemical characterization was made by, using the techniques reported in the manual on techniques of soil analysis applied to the remediation of contaminated sites (4). As well as the techniques ICP-OES for the determination of the concentration of lead in soil. Soil washing is carried out using three concentrations of EDTA (10mm, 80mm and 150mm), three values of initial pH (5, 6 and 7), for three sizes of particles of the soil (4.76 , 2.38 and 0.500mm).

Results: The physicochemical characterization of the soil problem showed that soil is sandy-clay, which has a pH of 6.52 a humidity of 38% and a total lead content of 3650ppm (Table 1).

The maximum removal of lead by washing (79.12 %) was obtained with a concentration of 10 mM EDTA, a particle size of 4.76mm and an initial pH of 7.0 . For the particle sizes smaller (2.38mm and 0.500mm), removals were achieved maximum of 70.44 % and 39.59 %, respectively for the same conditions. For the concentration of 80 mm EDTA clearance found a maximum lead of 65.34 %, to a particle size of 2.38mm and a pH of 5.0 , while that for the particle size of 4.76mm, the maximum removal efficiency was 64.23 % with a pH of 5.0 and for the particle size of 0.500mm, and the maximum clearance was 31.23 per cent to a pH 5.0 . For the washing process with 150mm of EDTA, Clearance was obtained a maximum

of 66.84 % for a particle size of 4.76mm , and a pH of 6, while, for particle sizes 2.38 and 0.500mm, maximum removal was 52.60% and 30.95 %, respectively, for an initial pH of 5.0 . The final pH values are between 7.1 and 8.8 .

Table 1. Soil physicochemical characterization

PARÁMETERO	VALUE
Texture	Sandy- clay
pH	6.52
Humidity	0.38
Total Lead in Soil	3650 ppm

Conclusions. The results of the process of soil washing with EDTA, are satisfactory for the elimination of lead in the contaminated soil. The particle size is a determining factor in the removal of the contaminating. It is possible that with the 10mm concentration satisfies the stoichiometric ratio of reaction for the formation of Pb-EDTA complex. However, their negative impact is attributed to the presence of organic matter that, when forming very stable complex with Pb, they impede the chelant activity of EDTA.

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References.

- 1.- Dolan J.,(2006). *Towards the sustainable development of modern road ecosystem*.The Ecology of Transportation: Managing Mobility for the Environment. Springer.275–331.
- 2.- Isoyama, M., and S. I. Wada. (2007).. J. of Haz. Mats 143:636–642.
- 3.- Huang JW, Cunningham SD (1996) New Phytol 145: 75–84
- 4.- Peters, R.W., Shem, L., (1992). Env Rem pp. 70–84.
- 5.- *Manual de Técnicas de análisis de suelo aplicadas a la remediación de sitios contaminados* Instituto Mexicano del Petróleo Secretaria del medio ambiente y recursos naturales, Instituto nacional de ecología, México, D.F 2006