



Comparative study between flushing and electrokinetic in-situ remediation technologies applied to a mercury contaminated soil from Almadén (Spain).

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The feasibility of two different remediation technologies for a mercury contaminated soil (5800 mg/Kg) from Almadén (Spain) was studied. One of these technologies, the in-situ soil flushing, has been used at field scale for some years and is basically accomplished by pumping an extraction fluid through the contaminated zone of the soil. Whereas the other one, the in-situ soil electroremediation, is considered an innovative technique that basically consists in the extraction of contaminants from the soil by means of an electrical field. Thus, when an electrical potential difference is applied between two electrodes inserted in the soil, the available ions in the pore aqueous phase (including the heavy metal ions) are mobilized by electromigration towards the opposite electrode where they are recovered and correctly treated.

The remediation of mercury contaminated soil is difficult because of the low solubility of mercury and its compounds. Therefore, both remediation technologies were enhanced by the use of complexing agents. As complexing agent for the column assays we chose iodide because it showed very good extraction ratios in previous batch experiments. Nevertheless, for the technique to be economically feasible a recovery process would be required for the used extraction solution due to the high costs of the iodide compounds. For instance, the price of HI 57% is around 30 \$/L. For the recovery we have tried a low temperature (50°C) thermal treatment in presence of iron powder, in order to remove the extracted Hg from the aqueous iodide solution. Experiments performed with both the fresh and the recycled solutions showed indis-

tinguishable results.

The flushing and electrokinetic assays were performed in lab columns of 50 cm² cross section and 20 cm length, which approximately contains 2 kg of contaminated soil saturated with water. At the end of each experiment the soil columns were divided into 10 cross slices in which the total mercury content was measured. In addition, the BCR sequential extraction procedure was performed both in the original contaminated soil and in each of these slices in order to evaluate the mobility and availability of the mercury in the soil before and after the remediation. In this sense, it was observed that after the remediation treatments, the mercury was effectively removed from the fraction of Hg associated to the reducible matter, whereas the one associated to the oxidizable matter was not. In addition, if the treatment is not completely accomplished, the mobility of mercury in the contaminated soil would increase, as can be concluded from the relative increase of Hg associated to the weak acid soluble fraction that we have obtained.