

The buffer capacity of the soil is one of the most important parameters in assessing the feasibility of different remediation techniques of soils contaminated by heavy metals (washing, flushing, electroremediation, etc.). In another work presented in this conference, we study the influence of the pH on the retention of lead in a soil from the mining district of Linares (Spain) contaminated by heavy metals. Two types of curves, the soil titration with different acid solutions and the resultant aqueous concentration of Pb, were simultaneously obtained in that work. It was observed that those curves strongly depend on the nature of the acid used and on the rate of addition of acid solutions.

It is well known that the phenomena involved in the titration of a soil-water mixture are usually under kinetic control (mass transfer- or sorption- kinetics). This fact was observed in the experimental results, in which the titration curves obtained with each acid strongly depend on the addition rate of the acid solution. Nevertheless, when this rate is high enough, reproducible results and almost indistinguishable curves are obtained, this is, the results are no longer affected by the acid addition rate. This could indicate that the experimental results thus obtained involve only the fast processes, which probably are very close to the equilibrium conditions. The validity of this assumption can be assessed by the comparison of the experimental results with the corresponding simulation ones obtained under equilibrium conditions.

In the current work, this assumption is studied in the soil contaminated from the mining district of Linares. In this case, the influence of the pH on the retention of lead under equilibrium conditions is obtained by the simulation of the aforementioned experimental results using two different freeware chemical equilibrium speciation software: Hydra-Medusa and Visual MINTEQ.

In these simulations, different lead species were considered according to the main cations and anions presented in that soil (Ca, Mg, Fe, Mn, carbonates, etc) and to the species added during the titration (nitrate, acetic or EDTA). The shapes of the titration curves obtained by the simulation under equilibrium conditions are similar to the corresponding experimental ones. Nevertheless, the kinetics of the dissolution-neutralization processes affects significantly the locations of the inflection points and of the plateau on those curves.

The solubility curves of lead in the aqueous phase of the slurry, the simulations performed with the two software programs reproduce adequately the amount of lead dissolved as a function of the pH (solubility curves). Nevertheless, these programs do not predict the behavior observed at the final part of the experiments, in which the total dissolution of Pb does not occur. This amount of the Pb presented in the soil that cannot be dissolved, is only predicted by Visual MINTEQ if the Pb adsorption on the hydrous manganese oxide is considered using the diffuse layer model (DLM) and the *dIm_Tonkin* database provided by this software.

Finally, the BCR fractionation of the lead in the soil after the titration experiments is also adequately reproduced by the Visual MINTEQ software.

Acknowledgements

Authors acknowledge the financial support provided by the Spanish Ministry of Innovation and the FEDER fund of the EU through the Research Project ERHMES, CTM2012-16824 and the UE project Electroacross IRSES-GA-2010 269289.

(12) Alternative carbon materials for electrochemical remediation

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The electrochemical remediation technologies involve different approaches, whose complexity is mainly driven by the pollutant nature. Thus, while inorganic contaminants have been effectively and efficiently removed from waste waters by electrochemical adsorption, organic pollutants are generally converted into less hazardous compounds. Such conversion