Geophysical Research Abstracts
Vol. 19, EGU2017-9509-1, 2017
EGU General Assembly 2017

Use of limestone filler as a sorbent for the removal of As(V), Pb(II), Cu(II), Zn(II) and Cd(II) in contaminated sites

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Many of the approaches used to treat soils contaminated by heavy metals are invasive, and do not restore the natural equilibrium of the environment [1]. For this reason, one of procedures used to stabilise heavy metal-contaminated soils in situ is to directly add amendments, which, while they may not totally eliminate toxic elements, help natural retention mechanisms, induce sorption and reduce mobility and bioavailability. In this respect, the use of calcareous materials may be an excellent, eco-friendly way for recovering this type of soils [2], and this communication reports studies made in our laboratory for such a purpose.

The influence of different variables in the preparation of mixtures used to stabilize contaminated soils (soil pH, temperature and composition of the contaminated soil / limestone filler) was studied by means of a factorial experimental design. The main interaction effects of the factors obtained on different contaminated soils were used along with the results of the physicochemical and mineralogical characterization in the same data matrix to be analyzed by principal components analysis (PCA). To evaluate the optimal values of the variables, spectroscopic techniques were used to measure the level of leached metals (Pb, Cd, Cu, As, Zn and Fe). The environmental conditions were simulated and controlled by means of a climatic chamber to evaluate simultaneously the processes of geochemical alteration and passivation of the mixture. The results obtained showed that the corresponding factors of the experimental design may be an important source of information to show correlations on some of the most significant variables such as the concentration of metals and, in this way, optimize the use of the in situ stabilizer.

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[2] C. A. Cravotta, M.K. Trahan. Appl. Geochem 5 (1999) 581-606.