The pH is one of the key parameters that determine heavy metal mobility and fate in soils and sediments. It is well known that the resistance of soil to a change in pH strongly affects the mobilization of heavy metals in the soil. Different single and sequential extraction tests and pHstat leaching tests (at constant pH) have been developed for the study of the influence of a pH-decrease on the heavy metal release from the soil. Nevertheless, the acid-base reactions in a soil-water mixture are not as fast as those that take place in the aqueous phase. This kinetic control makes that the determination of the buffer capacity of the soil (usually the acid neutralization capacity, ANC) cannot be obtained as straightforward as an acid-base titration.

The buffer capacity of a soil is usually determined by the addition of different amounts of acid to several aliquots of a soil-water mixture. The slurries pHs and heavy metal concentration in the aqueous phase are determined after a nominal time at which the equilibrium is assumed to be reached (from 24 to 72 hours). As for the pHstat leaching test, the acid neutralizing capacity (ANC) corresponds to the amount of acid added to a soil-water suspension to keep the pH at a predefined constant value, so an ANC is obtained for each reference pH. The main inconvenience of the latter approach is that the acid neutralization can be slow at certain pH values and therefore, the acid addition rate should be adequately modified, leading to longer tests (from 24 to 96 hours)

This work aims the study of the influence of the pH on the retention of lead in a soil from the mining district of Linares (Spain) contaminated by heavy metals. The methodology used here is similar to the aforementioned ones, but in this case, the acid addition rate is predefined to a value more than 3 times higher than a threshold value above which the pH versus time curve is independent of the rate of acid addition. The feasibility of the electrokinetic technique for the remediation of this soil is assessed from the results obtained with three different acid solutions (nitric, acetic or EDTA) and the lead fractionation in the soil, according to the BCR method, at the end of each experiment.

The experimental system used basically consists of a 2 L reaction vessel with flat flange and mechanical agitator that contains the initial water/soil mixture (1.2 L/0.4 kg). The reactor is closed with a glass lid with flat flange and 5 ground-glass necks. Two of these necks allow the assembling of a pH electrode and of a sampling system for the withdrawal of aqueous samples. Through a third neck of the reactor lid, the desired reagent solution is added at the predefined rate, while the evolution over time of pH values in the water-soil mixture is registered. At selected times; samples of 10 mL were withdrawn for the determination of Pb concentrations in the aqueous phase.

The results indicate that the solubilization of the 40% of the lead present in the soil is achieved at pH values of about 6.5, 5 and 2.5 for Na2EDTA, acetic- and nitric- acid respectively.