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EFFECTIVE REMEDIATION OF CADMIUM CONTAMINATED SOIL BY ELECTROKINETIC-ACTIVATED CARBON FIBER WITH PRETREATMENT OF CITRIC ACID

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Abstract

In this work, the influence of electrokinetic (EK) combined with activated carbon fiber (ACF) on the remediation of soil contaminated with cadmium (Cd) was investigated. The results clearly showed the effects of three different factors on the removal of Cd in soil were as follows: voltage gradient > anolyte type > electrode spacing. When citric acid/sodium citrate solution was acted as anolyte, electrode spacing was 31 cm, voltage gradient was 1 V/cm, and the treatment time was 400 hr, the total removal efficiencies of Cd was 62.82 %. The optimum adsorption capacity of ACF for Cd was 4.481mg. The unit energy consumption was only 3.094kW•h•g^{-1}. Citric acid/sodium citrate solution could increase current, electroosmotic flow (EOF) and conductivity. The cation exchange membrane prevented OH^- from entering the soil and effectively controlled the soil pH within 9. Higher water content fostered the diffusion and migration of Cd, but the excessive water content would cause the accumulation of solution and decrease the removal rate of Cd. Additionally, the dissociation effect of acetic acid on Cd^{2+} was lower than that of citric acid with more functional groups due to the fewer carboxyl functional group of acetic acid. Cd in the soil mainly existed in organic matter-bound fraction and residue fraction after remediation. Phytotoxicity studies showed that the remediated soil had no potential harm to the environment. In summary, this study provides an effective basis for the remediation of Cd contaminated soil.

Key words: activated carbon fiber, cadmium, electrokinetic remediation, fractionation, soil

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