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Integrated Electrokinetics-Adsorption Remediation of Saline-Sodic Soils: Effects of Voltage Gradient and Contaminant Concentration on Soil Electrical Conductivity

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Abstract

In this study, an integrated in situ remediation technique which couples electrokinetics with adsorption, using locally produced granular activated carbon from date palm pits in the treatment zones that are installed directly to bracket the contaminated soils at bench-scale, is investigated. Natural saline-sodic clay soil, spiked with contaminant mixture (kerosene, phenol, Cr, Cd, Cu, Zn, Pb, and Hg), was used in this study to investigate the effects of voltage gradient, initial contaminant concentration, and polarity reversal rate on the soil electrical conductivity. Box-Behnken Design (BBD) was used for the experimental design and response surface methodology (RSM) was employed to model, optimize, and interpret the results obtained using Design-Expert version 8 platform. The total number of experiments conducted was 15 with voltage gradient, polarity reversal rate, and initial contaminant concentration as variables. The main target response discussed in this paper is the soil electrical conductivity due to its importance in electrokinetic remediation process. Responses obtained were fitted to quadratic models whose ranges from 84.66% to 99.19% with insignificant lack of fit in each case. Among the investigated factors, voltage gradient and initial contaminant concentration were found to be the most significant influential factors