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Coupled Electrokinetics-Adsorption Technique for Simultaneous Removal of Heavy Metals and Organics from Saline-Sodic Soil

Salihu Lukman,[1] Mohammed Hussain Essa,[1] Nuhu Dalhat Mu'azu,[2] and Alaadin Bukhari[1]

[1]Department of Civil and Environmental Engineering, King Fahd University of Petroleum and Minerals, P.O. Box 8632, Dhahran 31261, Saudi Arabia

[2]Environmental Engineering Department, University of Dammam, Dammam 31451, Saudi Arabia

Abstract

In situ remediation technologies for contaminated soils are faced with significant technical challenges when the contaminated soil has low permeability. Popular traditional technologies are rendered ineffective due to the difficulty encountered in accessing the contaminants as well as when employed in settings where the soil contains mixed contaminants such as petroleum hydrocarbons, heavy metals, and polar organics. In this study, an integrated in situ remediation technique that 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 soil, spiked with contaminant mixture (kerosene, phenol, Cr, Cd, Cu, Zn, Pb, and Hg), was used in this study to investigate the efficiency of contaminant removal. For the 21-day period of continuous electrokinetics-adsorption experimental run, efficiency for the removal of Zn, Pb, Cu, Cd, Cr, Hg, phenol, and kerosene was found to reach 26.8, 55.8, 41.0, 34.4, 75.9, 92.49, 100.0, and 49.8%, respectively. The results obtained suggest that integrating adsorption into electrokinetic technology is a promising solution for removal of contaminant mixture from saline-sodic soils.