Environmental Engineering and Management Journal

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

DEVELOPMENT OF A MATHEMATICAL MODEL FOR REMOVAL OF CR FROM REAL CONTAMINATED SOIL BY ELECTROKINETICS

Yina Ding, Ming Zhou*, Xuefeng Wei, Ruichang Zhang

Department of Environmental Engineering, Henan University of Science and Technology, Luoyang, P.R. China

Abstract

This study investigated the potential to remove chromium (Cr) from real contaminated soil using electrokinetic remediation (EKR). Design-Expert software was used to analyze the effects of multiple variables on a response and to develop a simple mathematical model for the EKR of Cr-contaminated soil utilizing linear regression analysis. The weighting and effects of voltage, catholyte concentration (citric acid), and treatment time on EKR of Cr-contaminated soil, were investigated. To better understand EKR's effects, SEM photos of soil before and after remediation were provided, and Cr mass balance was calculated. Experimental results showed that treatment time had some effect on total Cr removal, but catholyte concentration and voltage gradient could significantly enhance total Cr removal. In the case-Cr(VI) removal, treatment time and voltage were significant model terms. The P-value for catholyte concentration exceeding 0.1 showed no significant impact on process performance within the selected range. The linear mathematical models obtained could fit the experimental data. For the equation of removal efficiency of total Cr, the determination coefficients R^2, R^2 predicted, and R^2 adjusted were 0.95, 0.9101, and 0.9385 respectively. For the equation of removal efficiency of Cr(VI), the corresponding values were 0.9937, 0.9886, and 0.9923 respectively. SEM photos of soil showed that the conditions of soil compaction were not improving by EKR, which showed that pollution of soil with Cr affected soil structure.

Key words: highway traffic noise model, influencing variable, noise pollution, regression

Received: February, 2023; Revised final: December, 2024; Accepted: March, 2025

* Author to whom all correspondence should be addressed: e-mail: axore@163.com; Phone: +86 0379-64231914; Fax: +86 0379-64231914