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Sorption-desorption Processes of Heavy Metal Contaminated Soft Soil During Electrokinetic Remediation

[1]MyungHo Lee · [2]Jai-Young Lee · [3]Soo Sam Kim · [4]Ha Ik Chung · [5]Masashi Kamon

[1]Senior Researcher, Department of Geotechnical Engineering Research, Korea Institute of Construction Technology (KICT), Korea
[2]Associate Professor, Department of Environmental Engineering, The University of Seoul, Korea
[3]Professor, Department of Civil & Environmental Engineering, Hanyang University, Korea
[4]Research Fellow, Department of Geotechnical Engineering Research, Korea Institute of Construction Technology (KICT), Korea
[5]Professor, Graduate School of Global Environmental Studies, Kyoto University, Japan

ABSTRACT

This paper describes sorption and desorption processes of inorganic pollutant occurring during electrokinetic (EK) remediation of cohesive soil. Batch isotherm tests were conducted with kaolin clay in order to examine the characteristic features of zinc sorption/desorption processes. A number of bench scale laboratory column tests were carried out with newly designed and developed EK cell in order to investigate the fundamental behaviour of contaminated soft soil subjected to an electric field. Research focused on the (i) zinc migration by the combined effects of electromigration (EM) and/or electroosmosis (EO), and the (ii) sorption characteristics of zinc contaminated kaolin by comparison with the electrically induced desorption and precipitation/dissolution (in the cathode region) occurring during the EK soil processing. The correlations of the applied voltage gradient, EK flow rate, and the development of pH gradient are examined and evaluated. The results showed that the removal efficiency was high during the early stage of EK processing due to the rapid desorption by the effects of electrokinetics in the cathode region. However, the majority of migrating zinc from the anode was precipitated in the cathode region due to the high pH environment. Therefore, the overall zinc removal under the applied voltage gradient of 3V/cm was found to be approximately 60% within 4 hours of the EK treatment.

Conditioning the cathode chamber by the addition of acetic acid during the processes reduced the degree of zinc precipitation in the cathode region. The findings indicate that flushing the ionic contaminants out of the soil specimen by increasing the EO forces during the treatment is significant for complete clean-up.

Keyword: electrokinetic, cohesive soil, precipitation, soil pH, dissolution, and removal efficiency.

Corresponding author:
MyungHo Lee (M.Eng.CAU, M.Sc.OX, Dr.Eng.Kyoto)
Senior Researcher
Department of Geotechnical Engineering Research
Korea Institute of Construction Technology (KICT)
2311, DaeHwa-Dong, ilSan-Gu, GoYang-Si, GyeongGi-Do, 411-712
Republic of Korea
Email: mhleecok@kict.re.kr OR electrokinetics@hotmail.com
Mobile: ++82 10 4634 9813
Tel: ++82 31 910 0237
Fax: ++82 31 910 0561