Study on Electrokinetic Remediation of Pb-contaminated Saturated Sand

Gang Li¹, Yu Li², Jinli Zhang^{3,*}, and Jia Liu⁴

¹ Shaanxi Key Laboratory of Safety and Durability of Concrete Structures, Xijing University, Xi'an, Shaanxi 710123, China;

² School of Management Engineering, Dalian University of Science and Technology, Dalian Liaoning 116052, China;

³ State Key Laboratory of Coastal and Offshore Engineering, Dalian University of Technology, Dalian, Liaoning 116024, China;

⁴ School of Geological Engineering and Geomatics, Chang'an University, Xi'an, Shaanxi 710054, China.

*E-mail: jlzhang@dlut.edu.cn

doi: 10.20964/2020.02.40

Received: 6 October 2019/ Accepted: 5 December 2019 / Published: 31 December 2019

Electrokinetic remediation is a green remediation technology for contaminated soil, and it has the advantages of low cost, easy operation, minimal secondary pollution, and broad application prospects. In this study, electrokinetic remediation and combined electrokinetic remediation experiments were carried out on Pb(II)-contaminated saturated sand. The distributions of current density (I_d), potential gradient (U_g), pH value, and Pb(II) were analyzed, and the energy consumption (E_c) of the electrokinetic remediation was discussed. The results showed that the removal rate (E_r) of Pb(II) reached 98.37% after 24 h when the 0.2 mol/L of KCl was the electrolyte and the U_g was 3 V/cm. With the electrokinetic remediation method, the coated titanium electrode had a significant advantage over the graphite electrode. The electrolysis efficiency increased as the concentration of KCl electrolyte increased. In addition, the conductivity of the KNO₃ electrolyte was higher than that of the KCl electrolyte. During the electrokinetic remediation process, acidification/alkalinization and a focusing effect might occur in the sand samples, which could affect the efficiency of the remediation. The acidification/alkalinization issue could be effectively addressed by adopting the combined electrokinetic remediation method using citric acid or sodium citrate as a buffer solution. The polarity exchange method had little influence on the electrokinetic remediation.

Keywords: electrokinetic remediation; lead contamination; saturated sand; electrolyte; buffer solution

[FULL TEXT](#)

© 2020 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).