

Removal of Mixed Heavy Metals from Contaminated Clay Soils Using Pulsed Electrokinetic Process

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Abstract : Electrokinetic remediation process was employed for the removal of four (4) heavy metals (Cr, Cu, Hg and Pb) from contaminated clay and bentonite soils under pulsed current supply mode. The effects of voltage gradient, pulse duty cycle and bentonite/clay ratio on the simultaneous removal efficiencies of the heavy metals were investigated. A total of thirteen experiments were designed and conducted according to factorial design with each experiment allowed to continuously ran for 3 weeks. Results obtained showed that increase in bentonite ratio decreased the removal efficiency of the heavy metals with no significant effect on the energy consumption. Conversely, increase in both voltage gradient and pulse duty cycle increased the heavy metals removal efficiencies with increased in energy consumption. Additionally, increase in voltage gradient increased the electrical conductivity and the soil pH due to due to continuous refill and replacement of process fluids as they decomposed under the induced voltage gradient. Under different operating conditions, the maximum removal efficiencies obtained for Cr, Cu, Hg, and Pb were 21.87, 83.2, 62.4, 78.06 and 16.65% respectively.

Keywords : clay, bentonite, soil remediation, mixed contaminants, heavy metals, and electrokinetic-adsorption

Conference Title : ICEEWM 2015 : International Conference on Environment, Energy and Waste Management

Conference Location : Istanbul, Türkiye

Conference Dates : August 17-18, 2015