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Electrokinetic Copper Removal from Kaolinite Soil under a constant electric current Using Activated Carbon Filter Media and its regeneration

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Abstract

Copper contamination is a common problem in many industrial and mining sites that requires remediation. We performed electrokinetic experiment under a constant electrical current of 20 mA to study its removal from standard kaolinite soil using activated carbon filter media (AC RFM). AC affinity to copper adsorption facilitated the contaminant removal. Then, copper desorption was easily achieved by flashing the AC filter media with low pH solution while the AC was reused. Kaolinite soil spiked with 2.5 g/L of copper sulfate to give 1 g/L copper concentration in the soil. 1 kg of the contaminated soil was packed in the electrokinetic cell and 25 g of granular activated carbon (GAC) filter media was added near the cathode electrode. Electrokinetic experiment was carried out for 7 days and soil was divided into 5 equal sections at the end of the experiment. Copper concentration in the soil was measured by the XRF analyser. Results revealed that copper removal was 90.74%-68.78% in the sections 1 to 4. Copper removal was negative in the soil section 5 close to the cathode due to high soil pH in that soil section. However, a significant amount of copper, approximately 45%, was captured by AC during the EK-AC treatment, resulting less copper precipitation in the soil section near the cathode. Therefore, AC RFM could significantly enhance copper removal in the EK experiment under a constant electric current. The AC RFM was removed from the electrokinetic cell and packed in a filtration column for treatment and reuse. Nitric acid solution was passed through the AC column, achieving more than 82.1% copper removal. The AC was flushed with deionized water to neutralize the pH to normal conditions before reuse. The experimental work showed the feasibility of contaminant entrapment in the AC filter media under a constant electric current without adding chemicals and easily recovery by acid leaching due to AC's high permeability. This will facilitate the process of contaminant removal from soil at the end of the electrokinetic remediation process that is usually accumulates near the cathode zone.

Biography

Romina Ghobadi, She is a final-year PhD student working on soil decontamination at the University of Technology Sydney, School of Civil & Environmental Engineering. She has received a master's degree in Engineering from University of Adelaide in Adelaide, Australia and her bachelor was in mining engineering, experiences include environmental engineering, soil remediation, soil analysis, metals extraction and analysis, ground water modelling, statistics and stochastics simulation.