“Electrokinetic remediation of chromium contaminated soil”

Waqas Zulfiqar

University of Agriculture Faisalabad, 38000, Pakistan

wz.kamoka@gmail.com

Introduction:

Chromium is a heavy metal and carcinogenic in the environment. Heavy amount of hazardous form of chromium exist in industrial waste that may transport to water, air and soil by various media. Permissible level of chromium in soil is 31mg/kg and in water is 0.05mg/L. Above this level it causes harmful diseases e.g. ulceration, DNA damage and kidney problems**.** An ecological and novel way; electrochemical decontamination of chromium contaminated soils is designed either to reduce hexavalent chromium to trivalent chromium or to remove it. The carcinogenic nature of hexavalent chromium Cr(VI) means that it represents a first-order environmental issue where soils and groundwater have become contaminated, as illustrated by the World Health Organization (WHO). In recent years, methods such as soil flushing, electro-kinetic remediation, bioremediation, thermal desorption, soil vapour extraction, geochemical fixation and phyto-remediation, have been used to successfully reduce Cr(VI) concentration in soil. Electro-kinetic remediation technique is emerging study to remediate heavy metals inside soil. This technique can be applied on any type of soil. Electro-kinetic technique works under the influence of potential gradient, usually 1V/cm. This study elaborates the mechanism to remove Cr from soil under the influence of potential gradient, in lab scale experiments.

Experimental:

A lab-scale experimental setup (Electro-kinetic cell) was designed by use of PVC tubes, as shown. There were three major parts of electro-kinetic cell including specimen, anode and cathode compartment.

Conclusions:

Under the influence of potential gradient, due the electrolysis, molecules transfer into ionic form and every ion travel towards its reverse polarity electrode. In this way the Cr ions mobilize towards cathode region of soil specimen

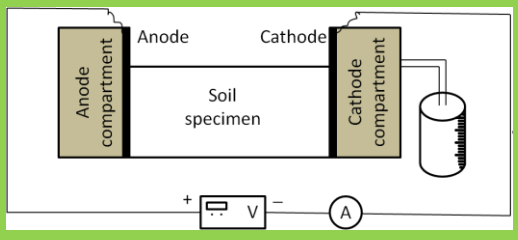

Fig. Electro-kinetic cell

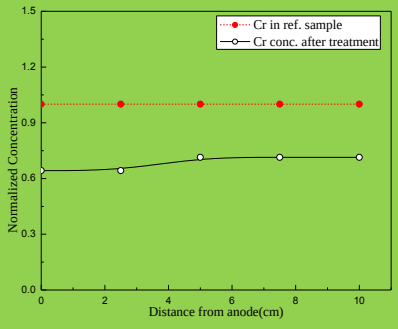

Fig. Removal concentration

Chromium concentration is significantly reduced from initial reference level after EK experiment. Near the anode, at low pH region, chromium might be present in hexavalent form as anionic species that have moved in anode chamber at the initial hours of the experiment indicated by the high concentration of chromium at anode chamber by Atomic Absorption Spectrophotomter (AAS). At the next section of soil, hexavalent chromium is being reduced to trivalent form by Fe(II) ferrous iron migration from anode into soil column. In this portion, Cr (IV) is moving towards anode and reduced Cr(III) complexes being cationic species, towards cathode indicated by low concentration of ions.