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ELECTROKINETIC SOIL PROCESSING AS A SUPPLEMENT TO BANK FILTRATION FOR REMOVAL OF PERSISTENT ORGANIC CONTAMINANTS

Mary Beth Sullivan*, Kenneth H. Carlson

ABSTRACT: The occurrence of pharmaceutical, personal health care products (PPCPs), and bioactive chemicals in the nation's wastewater effluents and drinking water supplies continues to be an area of great concern to water treatment professionals. Researchers have identified several of these compounds as persistent and have proven that these compounds remain essentially unaltered in conventionally treated drinking water and wastewater effluents. A water treatment method that has not been examined for use in the breakdown of these emerging, persistent compounds is electrokinetic soil processing (ESP). ESP uses subsurface electrodes to induce a low-level direct current which results in physiochemical and hydrological changes in the soil mass, leading to species transport by coupled mechanisms such as electromigration, electroosmosis, diffusion and electrolysis of water. This research examines the use of electrokinetic remediation as a supplement to river bank filtration for the breakdown of carbamazepine (CBZ), sulfamethoxazole (SMX), tris-(2-chloroethyl)-phosphate (TCEP), tris-(2-chloro-, 1-methylethyl)-phosphate (TCPP), and tris-(2-chloro-, 1-chloromethyl-ethylphosphate (TDCP). Soil column studies using media from an existing bank filtration site on the South Platte River in Colorado were conducted on native groundwater with known concentrations of CBZ, SMX, TCEP, TCPP, and TDCP. Column tests were run using varying electrolytes in the anode and cathode electrode wells under a current density of approximately 5 A/m2. Contaminant concentrations were examined and compared under the different electrolyte scenarios. Additionally, bulk water quality parameters were monitored throughout the soil column experiments and were subsequently compared to changes in contaminant concentrations across the column.

***** PhD Candidate, Colorado State University, Department of Civil and Environmental Engineering, Fort Collins, CO 80523-1372, USA, Phone: 970-988-0763, Email: mbtalty@engr.colostate.edu