

EGU22-2323

<https://doi.org/10.5194/egusphere-egu22-2323>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Adsorption of Chromium (VI) by soil sediments in heterogeneous porous media: a case study in Rupnagar district of Punjab, India.

Shreya Ganguly¹ and Sayantan Ganguly²

¹Indian Institute of Technology, Ropar, Civil Engineering, Rupnagar, India (shreya.19cez0011@iitrpr.ac.in)

²Assistant Professor, Department of Civil engineering, Indian Institute of Technology Ropar, Nangal road, Rupnagar, Punjab 140001, India, (sayantan.ganguly@iitrpr.ac.in)

Chromium (VI) is a known toxin and carcinogen which is still abundantly used in various industries primarily as an anti-corrosive agent. Thus in case of accidental spillage of it, without proper treatment and disposal, it might leach into the ground and pollute the soil and the groundwater table. The reactivity and solubility of Cr(VI) is extremely high in water making it more dangerous if consumed. The transport and fate of a contaminant in sub-surface porous media is governed by the processes of advection, dispersion and sorption. The transport of Cr (VI) is highly influenced by the processes of adsorption and desorption. The soil sediments have different physical and chemical properties which affect their adsorption efficiencies to a large extent. Hence, the knowledge of adsorptive capacities of the soil sediments is necessary to determine the time of travel of the contaminant plume in the porous media. The present study is conducted to determine the adsorption efficiency of natural soil if Cr(VI) gets accidentally leaked from a stainless steel manufacturing plant located in Rupnagar district of Punjab, India. Scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS) were performed to assess the surface morphology and chemical composition of the soil layers located above the local water table. The initial concentration of Cr(VI) was taken to be 2 mg/l to conduct the batch adsorption studies. The optimum values of parameters like: dose of soil, change of pH of the solution, the time of contact between the adsorbate and the adsorbent and concentration of metal ion adsorbed, are determined in the study. Langmuir, Freundlich and BET adsorption isotherms along with kinetic models were also examined to investigate the mechanisms of adsorption.

Keywords: Chromium (VI); Adsorption; Natural attenuation; Batch adsorption studies; Adsorption isotherms; Kinetic models.