Removal of Heavy Metals from Industrial Wastewater through Minerals

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Heavy metals are toxic to health and environment and causes harmful outcomes to the human beings. It is essential to take effective endeavors to remove the metals from contaminated water. In this research, naturally available brick materials with different compositions collected from Kandy (type A), Gampaha (type B), and Embilipitiya (type C) areas were used to remove Cu, Cr and Pb ions. These brick materials are cost effective and readily available alternative to conventional heavy metal removal. The characterization of brick materials is performed using X-Ray Fluorescence (XRF) and Nitrogen Adsorption – Desorption analyser. Calculated surface area and total pore volume and pore width of type A, B, and C are lie respectively, in the range of 128-154 m2/g, 0.24-0.45 cm3/g, and 5.6-16.7 nm. Main objective of this research is to investigate how the characteristics of adsorbents influence the adsorption process and identifying the best model to describe the kinetic and equilibrium adsorption to purify the metal contaminated water. Results indicate that Pseudo – first – order kinetics model properly described the adsorption of Cu2+ to the brick type C, which has maximum adsorption capacity of 497 mg g-1. The adsorption process of Pb2+ to the brick type A and Cu2+ and Pb2+ to brick type B and C were well-fitted with Pseudo – second – order kinetics model. In equilibrium studies, Langmuir isotherm showed a better fitness in adsorption of Cu2+ into brick type A and C, Pb2+ into brick type B, whereas Freundlich isotherm well represented the adsorption characteristics of Cu2+ into brick type A, Pb2+ into brick type B and Cr6+ into all brick types. The comparison results indicate that the use of brick types A, B, C can be used as potential nan sorbents to remove heavy metals from industrial waste waters.

Keywords: Heavy metals, Minerals, Adsorption, Specific surface area, Ion concentration