Equilibrium Studies For Adsorption of Cadmium Ions Using Treated Maize Stalk Charcoal

Duncan Cheruiyot Mutai
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Abstract

Discharge of toxic heavy metals into the environment as industrial waste causes extensive soil and water pollution. The associated risk of pollution of heavy metals has increased over the recent years to a great extent. Most common metals such as Pb^{2+}, Cd^{2+} and Cr^{3+} accumulates in organisms causing numerous diseases and disorders. A number of experiments have been done to eliminate heavy metals from wastewater because of high risk they pose to human health and the environment/ecosystem. Several conventional processes have been used in recent years for treatment of heavy metals contamination and they include; chemical oxidation, ion exchange, membrane separation, reverses osmosis, chemical precipitation, and electron dialysis among others. These methods were found to be economically unfavorable and complicated and are only used in special cases for wastewater treatment. They are known to be expensive, energy intensive and normally associated with generation of toxic by-products. Rapid industrialization has aggravated the release of heavy metals into the water bodies and ecosystem. Effluents from industries such as petroleum refining, wood processing, pigments and dyes, textile, leather processing, electroplating industries among others are known to be the most common sources of heavy metals since they contain higher concentration of heavy metals in their waste waters. In industrial effluent, cadmium is a pollutant which is widely found. Its toxicity affects the ecosystem and presents potential hazard to human health. Due to the magnitude of heavy metal pollution problem, the technologies development research into new and cheaper methods of environmental remediation of toxic metal ions is currently a major interest. Bio-sorption method can be used to remove toxic heavy metals in dilute solutions. Bio-sorption method involves the use of biological waste materials and for this project we used treated maize stalk/char for maximum removal of heavy metal for instance Cadmium (II) ions from wastewaters. Various biological materials have been investigated with a considerable degree of success for example rice husks to adsorb heavy metals contamination. This project attempts to employ the principle of using waste to treat waste and is more efficient since agricultural by-products are readily available. A carbonaceous adsorbent material was obtained from treated maize stalk/char and was tested for its efficiency in removing cadmium ions in wastewaters. The effects of adsorbent dose on the adsorption of cadmium ions by treated maize stalks charcoal was examined. The adsorption data were feed in Langmuir isotherm model and was used to analyze the equilibrium data.