

Equilibrium Studies For Adsorption Of Pb²⁺ Ions From Aqueous Solution Using Activated Maize Stalk Charcoal

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Abstract

Over the past years the world has experienced an increasing environmental problem due to the contamination of water bodies and the ecosystem by discharge of toxic heavy metals. Heavy metals are non-biodegradable pollutants and persist in the environment and due to this, they should be eliminated. Their exposure to human beings even at low concentrations is dangerous and can cause damage to organs and organ systems. Some of the most affected parts of the human body are the central nervous system, kidneys and blood. This can end in disorders, excessive damage due to oxidative stress induced by free radical formation or even death. These heavy metals originate from different sources but the main source is from discharged untreated industrial effluents. The elimination of these metals from the environment has attracted researchers and some of the methods which have been used in their removal include; adsorption using activated carbon, ion exchange, chemical precipitation, solvent extraction, electron dialysis and biological methods. However, due to the ineffectiveness these methods have been defeated by biosorption. Biosorption is a recent method of adsorption which involves use of cheap adsorbents and it has been applied to remove Pb²⁺ ions and other heavy metals from wastewaters at a considerable degree of success.

In this work, the effect of various parameters on the equilibrium for adsorption of Pb²⁺ ions on activated maize stalk charcoal were determined using Langmuir isotherms. The kinetics of the Pb²⁺ ions adsorption were be studied/modelled using the pseudo first and second order kinetics. The data obtained were analyzed using different methods which include; analysis of variance (ANOVA), T-test, Q-test, excel spreadsheet and other statistical data analysis methods. The results were used in determining whether maize stalk is an appropriate adsorbent for domestic water remediation.

