

# **Kinetics and Equilibrium Studies Using Lead Ions onto Treated Maize Stalk Charcoal**

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## **Abstract**

According to recent reports in Kenya, there has been suspected cases of metal ions in the foodstuffs which could be from water resources. The country has been towards actualizing vision 2030 which is contributing to mass growth of industries leading to discharge of effluents into waters. Activities like burning of fossil fuels, smelting of ore acid extraction, metal plating and battery making discharges are the most Lead (II) ions sources directed into waters. It is a very toxic heavy metal causing various health problems which includes malfunctioning of heart, kidney, nervous system, reproductive systems and also death in severe cases. During a visit to Embu sewage treatment plant, it was found that there is no available technique for the removal of heavy metals from effluents before releasing it into river Rupingazi. The river runs down to Mbeere sub-county, dry lower part of the Embu county. Farmers are using water from the river for irrigation. This has resulted to investigations of various techniques on removal of Lead (II) ions from the water which includes biosorption technique. This study was evaluating the viability and success degree of activated maize stalk charcoal adsorbent on Lead (II) ions removal from wastewater. The maize stalk is readily available and environmentally friendly. The technique has been investigated by use of maize cob, maize stalk biomass and maize Stover and found to have considerable abilities to adsorb heavy metals from wastewater, therefore a reason to study activated maize stalk charcoal. Maize stalks were collected from D.O.E Caritus Embu 1km from University of Embu towards Kangaru market. They were dusted and carbonized in a prepared furnace of limited air supply in University farm to obtain charcoal. The charcoal was taken to the chemistry laboratory for investigation of initial concentrations of lead (II) ions effects. The batch experiment on initial lead (II) ions concentration was investigated using 5ppm,10ppm,20ppm and 50ppm concentrations prepared in laboratory by dissolving lead nitrate salt. The adsorption data obtained from Atomic Absorption Spectroscopy was subjected to Langmuir and Freundlich isotherms. The kinetics of lead (II) ions was modelled by pseudo-first-order and pseudo- second-order equations. The data was subjected to Analysis of Variance and spreadsheet software.