

This study, the adsorption kinetics and thermodynamic of unripe plantain peel charcoal mixed with quail egg shell for the removal of Zn (II), Pb (II), Cu (II), and Cd (II) from aqueous solution was carried out. This was done in order to consider its application for the removal of heavy metals in waste water.

The effects of some parameters such as; pH, temperature, and contact time on the adsorption of Zn (II), Pb (II), Cu (II), and Cd (II) were studied in the experiment. The influence of the pH of the metal ion solutions on the uptake levels of the metal ions were carried out between pH 3 and pH 7. The influence of contact time on the adsorption of Zn (II), Cu (II), Pb (II) and Cd (II) at pH 3, 5, and 7 in a thermostated water bath within the time intervals of 20 minutes ranging from 0 to 180 minutes and at room temperature, 30, 40 and 50° C.

The optimum pH for Zinc and lead removal was 5 while copper and cadmium was at 7. An equilibrium time of 140 minutes was required for the adsorption of Zn (II), equilibrium was attained with 180 minutes for Pb (II) and Cu (II), for Cd (II), equilibrium was attained between 120-140 minutes. The adsorption data fitted into the pseudo-second order kinetic model. Adsorption parameters were determined using Langmuir, Freundlich and Temkin Isotherm. The thermodynamic study showed that the adsorption was a physical adsorption process, and also exothermic in nature. The study showed that there was an increase in the uptake of heavy metal via the addition of quail egg shell to the unripe plantain peel charcoal.

The results showed that unripe plantain peel charcoal mixed with quail egg shell has a promising potential to remove heavy metal from industrial waste water of effluents.