

Understanding the Utilization of *Luffa cylindrica* in the Adsorption of Heavy Metals to Clean Up Wastewater

Authors : Akanimo Emene, Robert Edyvean

Abstract : In developing countries, a low cost method of wastewater treatment is highly recommended. Adsorption is an efficient and economically viable treatment process for wastewater. The utilisation of this process is based on the understanding of the relationship between the growth environment and the metal capacity of the biomaterial. *Luffa cylindrica* (LC), a plant material, was used as an adsorbent in adsorption design system of heavy metals. The chemically modified LC was used to adsorb heavy metals ions, lead and cadmium, from aqueous environmental solution at varying experimental conditions. Experimental factors, adsorption time, initial metal ion concentration, ionic strength and pH of solution were studied. The chemical nature and surface area of the tissues adsorbing heavy metals in LC biosorption systems were characterised by using electron microscopy and infra-red spectroscopy. It showed an increase in the surface area and improved adhesion capacity after chemical treatment. Metal speciation of the metal ions showed the binary interaction between the ions and the LC surface as the pH increases. Maximum adsorption was shown between pH 5 and pH 6. The ionic strength of the metal ion solution has an effect on the adsorption capacity based on the surface charge and the availability of the adsorption sites on the LC. The nature of the metal-surface complexes formed as a result of the experimental data were analysed with kinetic and isotherm models. The pseudo second order kinetic model and the two-site Langmuir isotherm model showed the best fit. Through the understanding of this process, there will be an opportunity to provide an alternative method for water purification. This will be provide an option, for when expensive water treatment technologies are not viable in developing countries.

Keywords : adsorption, *luffa cylindrica*, metal-surface complexes, pH

Conference Title : ICCPE 2023 : International Conference on Chemical and Process Engineering

Conference Location : Singapore, Singapore

Conference Dates : November 27-28, 2023