

Kinetics of Adsorption of Heavy Metal Cu (II) from Aqueous Phase on Modified Agricultural Waste

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ABSTRACT

A potential low-cost adsorbent surface was prepared from agricultural waste for the adsorption of Cu (II) metal ions from the aqueous phase. The surface was characterized by SEM for determining the porosity of the prepared surface and ratifying adsorption of metal ion on surface. The adsorption results are quite impressive and show that the prepared surface is efficient for the adsorption of Cu (II) ion. It was found that the effect of pH and adsorbent concentration are co-related to each other and ions released by the surface increase the pH of the solution which is favourable for the adsorption. Langmuir isotherm fits best on adsorption data. Pseudo-second order model seems good for the different adsorbent concentration. It was concluded that the prepared surface can effectively be used as a adsorbent for the removal of toxic metal from aqueous waste water and metal can be recovered from the adsorbent surface.

Keywords: Cu (II), Adsorbent, Agricultural Waste, Kinetics

INTRODUCTION

Exposure of non-essential metals can produce harmful effects on human and other living organisms. Copper (Cu) a non-essential and toxic metal can be found in industrial effluent if released in environment untreated will be threat to ecosystem and living organisms. From main streams these heavy metal can accumulate in food chain and become the part of diet of animals and humans (Abdel-Rahman, 2022; Gholami & Rahimi, 2023). Among other methods of waste water treatment adsorption has been found to be low cost and efficient. Activated charcoal due to its great adsorption properties used for the adsorption dyes and metal toxicant from waste water (Husien et al., 2022). The utilization of agricultural waste for conversion of charcoal is an economical and environment friendly approach (Asim et al., 2020). The working parameters are optimized by batch adsorption experiment and kinetic of adsorption of Cu (II) on adsorbent surface is studied by fitting the model on obtained data (Bashir et al., 2020).

OBJECTIVES

The objective of current research is to prepare surface for adsorption of Cu(II) ions and optimize the method of adsorption by identify the factors affecting the adsorption process. The Kinetic of the adsorption process is also determined.

METHODOLOGY

The adsorbing surface was prepared by igniting potato peel. The batch adsorption experiments were carried out for optimization of adsorption method. Effect of different parameters for adsorption efficiency such as concentration of Cu (II), adsorbent quantity, pH and adsorption time was studied. The remaining concentration of Cu (II) ion was determined using spectrophotometer.

RESULTS

The prepared surface is cost effective and efficient for the adsorption of heavy metal ion Cu (II). pH plays an important role for surface activation and availability of adsorption sites for metal cations. In acidic medium Hydronium ions compete with metal cation making adsorption of metal unfavorable. While neutral and basic medium is favorable for effective adsorption. Increasing adsorbent dosage and time increase the adsorption process. Langmuir isotherm fits the adsorption data.

CONCLUSION

In this research Cu (II) ion was subjected for adsorption isotherm studies on to low cost adsorbent surface. It was found that prepared surface effectively adsorb Cu (II) ions from aqueous phase under neutral pH conditions and can be recovered using a chelating agent.

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