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Effective adsorption of lead and copper from aqueous solution by samaneasaman and banana stem

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Abstract. The sorption of metal ions with low-cost adsorbents plays an important role in sustainable development. In the present study, the efficacy of sugarcane bagasse, rain tree fruits (samaneasaman), banana stem and their mixtures, used as bio-sorbents, in the removal of Cu(II) and Pb(II) ions from aqueous solution is evaluated. Batch studies are conducted, and residual ions were measured using Inductively Coupled Plasma (ICP)-atomic spectrometer. Effect of pH, initial metal ion concentration, reaction time and adsorbent dosage are studied. The Pb(II) removal efficiency was observed to be 97.88%, 98.60% and 91.74% for rain tree fruits, banana stem and a mixture of adsorbents respectively. The highest Cu(II) ion removal was observed for sugarcane bagasse sorbent with an efficiency of 82.10% with a pH of 4.5 and a reaction time of 90 min. Finally, desorption studies were carried out to study the leaching potential of adsorbent, and it was found that the adsorbent is stable in water than the other leaching agents such as HCl, ammonium acetate, Sodium EDTA. Hence, these adsorbents can be effectively used for the removal of these heavy metals.

Keywords: low-cost adsorbents; heavy metal; lead; copper; banana stem; raintree fruit

1. Introduction

A more significant part of the world is facing freshwater shortage and expected to increase rapidly in coming decades as the population increases. Every year over 12 million people die due to water shortages, polluted water, and unsanitary living conditions (WHO 1997). In many developing countries ponds, lake and rivers are used for dumping untreated effluents and municipal sewage wastes, industrial poisons, and harmful chemicals. The industrial effluents, domestic waste, and agricultural runoff are the primary sources of heavy metal pollution in the environment. The pollutants which contain heavy metals (Cd, Cr, Cu, Hg, Pb, and Zn) can affect every human being, aquatic life, and the environment through food and water chain. Among all

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