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Adsorption of Lead(II) and Copper(II) Ions from Wastewater Using Biodegradable Acrylic Acid-Chitosan Hydrogel Polymer for Environmental Purification

Makid Maskawat Marjub^{1,2}, Fahima Sultana Tuhen², Nazia Rahman¹ ¹Institute of Nuclear Science and Technology, Bangladesh ²Jahangirnagar University, Savar, Bangladesh

Water pollution due to heavy metal contamination has become a leading problem in the recent years. Current techniques used for heavy metal removal from industrial effluents are mostly ineffective due to low adsorption power and non-renewability. In this study, a fully biodegradable and reusable polymer adsorbent named hydrogel has been developed for adsorbing heavy metal ions from wastewater. The adsorbent has been constructed by linking acrylic acid with chitosan using gamma radiation from Cobalt-60 source. The designed adsorbent has been characterized using FTIR. The adsorption capacity of the hydrogel for Cu(II) and Pb(II) at different contact times, pH, and metal ion concentrations has been measured using Atomic Absorption Spectroscopy (AAS). Kinetic adsorption data has been calculated with the help of pseudo-first-order and pseudo-second-order equations. Experimental metal adsorption data matched with Langmuir isotherm model. The maximum adsorption capacity of the hydrogel was found to be 192 mg/g and 171 mg/g for Pb(II) and Cu(II) respectively from the Langmuir isotherm model. Furthermore, the hydrogel displayed high reusability maintaining maximum efficiency. The data indicated the designed hydrogel was environment-friendly, regenerative, and can be used effectively for removing of toxic heavy metal ions from wastewater for a sustainable environment.

mmmarjub@gmail.com