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Removal of heavy metal ions with the use of chelating copolymers obtained by graft copolymerization of vinyl acetate-ethyl acrylate comonomers onto guar gum using ascorbic acid-potassium persulphate redox pair as initiator

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Water is the most essential commodity for our civilization to flourish. Availability of safe drinking water is the most important prerequisite for a sound public health system. The contamination of water by heavy metal, originating either from natural soil sources or from anthropogenic source is a matter of utmost concern to the public health. Remediation of contaminated water is of highest priority since billions of people all over the world use it for drinking purpose. Adsorption represents an efficient, economic and convenient method, which can separate low amounts of substances from large volumes of solution. To develop low cost and environment friendly technologies for removal of metal ions from water systems, a new sorbent material based on guar gum (GG) was prepared by the graft copolymerization of binary monomer mixture of vinyl acetate (VAC) and ethyl acrylate (EA) using potassium persulphate (KPS) and ascorbic acid (AA) as radical initiator. The concentrations of (AA), (KPS), (VAC+EA) and grafting temperature were varied to optimize the binary grafting. The addition of EA as a comonomer has shown a significant increase in graft copolymerization of VAC onto the guar gum. The optimal G% sample (75%) has been extensively characterized using FTIR, TGA, and SEM. The copolymer sample having maximum G% (75%) was evaluated for the removal of mercury and uptake parameters such as affinity of metal ions, sorbent dose, initial Hg (II) concentration, temperature and agitation time were investigated. Kinetic modeling has been studied and the Langmuir and Freundlich adsorption models were applied to explain the isotherms and isotherm constants. Thus, an adsorbent with good metal-chelating properties is obtained for the removal of Hg (II) from synthetic aqueous solutions.

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Effect of incorporating cellulose nanofiber on biodegradation of poly(vinyl alcohol) nanocomposite in a controlled composting environment

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The aim was to study the effect of incorporating cellulose nanofiber on biodegradation of poly(vinyl alcohol) nanocomposite in a controlled composting environment. The nanocomposite was prepared by freeze-drying and the effect of (5, 10, 20 and 30%) CNF loading on biodegradation properties nanocomposite in controlled composting was characterized. Biodegradation tests were carried out using the standard ASTM D6340-98 which specifies a method for determining the carbon dioxide evolution. The results indicated that the biodegradation of PVA was increased with the introduction of CNF into a polymer matrix. With the addition of 5, 10, 20 and 30% of cellulose nanofiber, rate of biodegradation of nanocomposite increased. Furthermore, loss mass measurements showed that the presence of CNF led to an increase of biodegradability of PVA-based materials. With the addition of 5, 10, 20 and 30% of cellulose nanofiber respectively, increase in the amount of loss mass of the nanocomposite was observed with 4.78, 5.23 and 6.72%.

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