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Adsorptive removal of copper (II) and lead (II) using chitosan-g-maleic anhydride-g-methacrylic acid copolymer

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Abstract

In the present work, the maleic anhydride and methacrylic acid monomers were grafted one after another onto chitosan by using ceric ammonium nitrate as the initiator. The optimum conditions for grafting were studied by varying the initiator concentration, monomer concentration and reaction temperature. The synthesized grafted samples were subjected to various analytical techniques such as FTIR, XRD, TGA and DSC methods. The proof of formation of graft copolymer was ascertained from the results of FTIR analysis and XRD studies. The TGA and DSC results conclude the highly thermally stable behavior of the prepared graft copolymer sample. The prepared graft copolymer was utilized for removing copper and lead from aqueous solutions and optimum adsorption parameters were evaluated under various pH, adsorbent dose, contact time and initial metal ion concentration. The adsorption and kinetic studies have been explained by Langmuir, Freundlich and pseudo - first order, second order and intra particle diffusion models. From the results, it was seen that Freundlich isotherm was best fit in the case of adsorption studies which followed pseudo second order kinetics. The obtained results showed that the chitosan-g-maleic anhydride-g-methacrylic acid copolymer was very efficient in removing the heavy metals copper and lead from aqueous solution.

Keywords: maleic anhydride; methacrylic acid; ceric ammonium nitrate; graft copolymer

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