Study on adsorption, regeneration, and reuse of crosslinked chitosan graft copolymers for Cu(II) ion removal from aqueous solutions

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Received 5 September 2012; Accepted 22 April 2013

ABSTRACT

This study deals with the adsorption, regeneration, and reuse of chitosan-graft-itaconic acid and chitosan-graft-crotonic acid beads for Cu(II) ion removal from aqueous solutions. For this aim, adsorption capacities, adsorption kinetics, and adsorption isotherms of these crosslinked chitosan-graft-copolymeric beads were investigated in detail. The maximum adsorption capacities of chitosan-graft-itaconic acid and chitosan-graft-crotonic acid beads were found to be 0.31 and 0.25 mmol/g, respectively. In addition, it was found that the pseudo-second-order kinetic model is more suitable than pseudo-first-order model for the adsorption of Cu(II) ions onto the beads according to adsorption kinetics data. Adsorption isotherm data were evaluated using Freundlich, Langmuir, Brauner–Emmet–Teller, Dubinin–Radushkevich and Temkin isotherm models. The results revealed that the adsorption of Cu(II) ions onto the beads fits very well Freundlich isotherm model. Then, the beads were regenerated with an acid solution, and they were reused for adsorption of Cu(II) ions. Regeneration study results showed that, the metal ion removal capacity of regenerated beads did not change significantly in the end of the fourth regeneration period compared to the first regeneration period. It was concluded that the crosslinked chitosan-graft-copolymeric beads might be suitable adsorbent for the removal of metal ions from aqueous effluent.

Keywords: Adsorption; Crosslinked copolymers; Graft copolymers; Chitosan; Crotonic acid; Itaconic acid

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