



Pb (II) Ions Adsorption onto Biomaterial Chitosan Hydrogel Beads - Isotherm And Kinetic Studies

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Abstract

The present research work attempted to investigate the batch mitigation of Pb (II) ions from water onto chitosan hydrogel beads (CHB) as an adsorbent. The batch adsorption of Pb (II) ions onto CHB was studied as a function of various parameters viz. pH, contact time, initial Pb (II) ions concentration and adsorbent doses. The equilibrium adsorption data were fitted by the Langmuir and Freundlich models where the maximum uptake of Pb (II) ions obtained as 8.928 mg/g. The adsorption kinetics was evaluated by pseudo first order and Pseudo second order kinetics mechanism. The adsorption data well obeyed pseudo second order kinetics.

Keywords: Chitosan; Pb (II) ions; Adsorption; Isotherm; Kinetics.

Introduction

Pb (II) ions pollution in water or industrial wastewater is of distinctive concern for the environmentalist and medical health scientist due to its extreme toxicity even in smaller amount and having no any biological role [1]. It affects nearly every physiological organ system viz. liver, kidneys, reproductive system, gastrointestinal system etc. [2]. Several treatment technologies for Pb (II) ions mitigation from water viz. chemical precipitation, membrane separation, ion exchange, coagulation, reverse osmosis, evaporation and adsorption are developed [3]. Amongst all these techniques, adsorption process is comparatively found to be effective and economic for water treatment application [4]. Nevertheless the main pitfall of adsorption process is the cost of adsorbents, which ultimately causes the expensive wastewater treatment application. One of such low cost adsorbent mostly used for the water treatment application is the chitosan. Chitosan is an amino polysaccharide, biomaterial obtained as an alkaline deacetylation product of chitin which is an exoskeleton part of crustacean's family such as prawns, crab, shrimps, krill, insects etc. [5]. This biopolymer used as an excellent adsorbent for the uptake of transition heavy metal ions and dyes.

The present study concerns batch removal of Pb (II) ions as a function of various parameters such as pH, adsorbent doses, agitation time and initial Pb (II) ions concentration. The batch adsorption experimental data were fitted to Langmuir and Freundlich isotherm models. The kinetics of adsorption was determined based on the pseudo first order and pseudo second order kinetics mechanism.