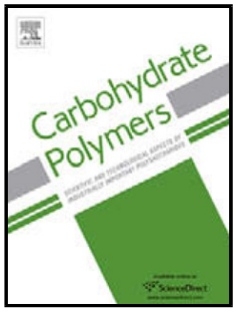

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Magnetic chitosan-(D-glucosimine methyl)benzaldehyde Schiff base for Pb^{+2} ion removal. Experimental and theoretical methods

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Highlights

- Synthesis of cross linked magnetic chitosan using D-glucosamine and terephthaldehyde
- Detailed characterization of nanocomposite by various methods
- Removal of Pb(II) ion from aqueous solution with high absorption efficiency
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Abstract

Magnetic chitosan nanocomposite (magnetic chitosan-(D-glucosimine methyl)benzaldehyde, MCS-Sch) on the basis of Schiff base-functionalized magnetite nanoparticles was synthesized. The prepared MCS-Sch was characterized by ^{1}H NMR, FT-IR, XRD, SEM, EDX, DLS, and VSM analysis. The MCS-Sch can be removed from aqueous solution with the help of an external magnet. The efficiency of the synthesized nanocomposite was studied for the Pb(II) ion removal from aqueous solutions. The effects of pH, contact time and initial concentration on the adsorption process were evaluated. Based on the Langmuir isotherm model, the maximum adsorption capacity of MCS-Sch obtained 121.95 mg/g for Pb(II) ion. The binding of prepared nanocomposite and Pb(II) ion was reversible, so the MCS-Sch can maintain its ability for metal ion removal from aqueous solutions. Finally, theoretical calculations showed that the presence of aromatic ring at the prepared magnetic chitosan nanocomposite, MC-Sch, is a favorable factor in Pb(II) ion absorption.

Keywords: Chitosan; Schiff base; D-glucosamine; Terephthalaldehyde; Heavy metal

1. Introduction

Pollution by heavy metals is a great threat to the environment and human health because of their toxicity, non-biodegradability, carcinogenicity, and bioaccumulation in living organisms (Shahzad, Miran et al. 2017). Heavy metals are potentially toxic at very low concentrations; for example, the United States