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Synthesis and characterization of graphite doped chitosan composite for batch adsorption of lead (II) ions from aqueous solution

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ABSTRACT

The adsorption of poisonous lead (II) from aqueous solution using graphite doped chitosan composite as an adsorbent has been carried out. The characterizations of graphite doped chitosan composite were studied by using instrumental techniques like X-ray diffraction, Fourier Transform Infrared Spectroscopy and Scanning Electron Microscopy. The XRD study showed the crystalline nature of synthesized graphite doped chitosan composite with sharp and symmetric peaks. SEM morphology showed wide range of porosity that could achieve high lead (II) sorption. FTIR investigation evidenced that the presence of C=O and –OH functionalities participated in lead (II) adsorption from aqueous solution. The influence of pH, contact time, dose of adsorbent and initial metal ion concentration on removal of lead (II) was investigated. The adsorption efficiency was found to be pH dependent and the maximum 98% lead (II) removal observed at optimum pH 6. Results showed that the maximum adsorbent capacity was at dosage of 1g/L and equilibrium time achieved at 120 min. Equilibrium adsorption experiments were studied at room temperature and data obtained fitted to Langmuir and Freundlich adsorption isotherm. Langmuir model had higher R^2 values of 0.943 with sorption capacity of 6.711 mg of adsorbate/g of adsorbent which fitted the equilibrium adsorption process more than the Freundlich model. The adsorption kinetics was analyzed using pseudo first order, pseudo second order and intraparticle diffusion models. Experimental data better fitted with pseudo second order kinetics model. The results illustrated that graphite doped chitosan composite has the potential to remove lead (II) ions from aqueous solution.

Keywords: Graphite doped chitosan composite; lead (II); adsorption; isotherm; kinetics.

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