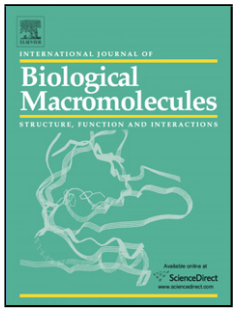

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High surface area mesoporous activated carbon-alginate beads for efficient removal of methylene blue

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HIGHLIGHTS

- High surface area activated carbon-alginate beads were synthesised.
- The process of adsorption was carried out under different adsorption conditions.
- The adsorption kinetics, isotherms and thermodynamic were studied.
- The maximum adsorption capacity of 230 mg/g was achieved for 100 mg/L of MB solution.

Abstract:

High surface area mesoporous activated carbon-alginate (AC-alginate) beads were successfully synthesised by entrapping activated carbon powder derived from Mangosteen fruit peel into calcium-alginate beads for methylene blue (MB) removal from aqueous solution. The structure and surface characteristics of AC-alginate beads were analysed using Fourier transform infra-red (FTIR) spectroscopy, scanning electron microscopy (SEM) and surface area analysis (S_{BET}), while thermal properties were tested using thermogravimetric analysis (TGA). The effect of AC-alginate dose, pH of solution, contact time, initial concentration of MB solution and temperature on MB removal was elucidated. The results showed that the maximum adsorption capacity of 230 mg/g was achieved for 100 mg/L of MB solution at pH 9.5 and temperature 25 ^{o}C. Furthermore, the adsorption of MB on AC-alginate beads followed well pseudo-second order equation and equilibrium adsorption data were better fitted by the Freundlich isotherm model. The findings reveal the feasibility of AC-alginate beads composite to be used as a potential and low cost adsorbent for removal of cationic dyes.

Keywords: activated carbon; activated carbon-alginate beads; methylene blue; adsorption isotherm; adsorption kinetics

1. Introduction

Dyes are colour pigments utilized in colour industries for colourizing various products. They are extensively used in various industries such as textile, food, paper production,