Adsorption and desorption studies on the performance of Fe–loaded chitosan carbonized rice husk for metal ion removal

Sivaraju Sugashini, Khadhar Mohamed Meera Sheriffa Begum*

Department of Chemical Engineering, National Institute of Technology, Tiruchirappalli 15, Tamil Nadu, India
Tel. +91 431 2503109; Fax: +91 431 2500133; email: meerasheriffa@gmail.com

Received 2 May 2012; Accepted 6 March 2013

ABSTRACT

Reuse of agro-waste into useful adsorbents like activated carbon has considerable attention in waste water treatment. Usually the activation of carbon is done by treating it with inorganic chemicals, polymers, biopolymers, etc. This paper deals with the preparation of novel Fe–loaded chitosan carbonized rice husk beads (Fe–CCRB) by blending Fe (metal)–loaded chitosan (organic compound) and carbonized rice husk. The prepared Fe–CCRB was used for the removal of metal ion. The surface properties of the adsorbent were characterized by scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR) and Brauner–Emmett–and Teller (BET) analyzer. The effects of process variables, such as contact time, agitation speed, initial metal ion concentration, adsorbent dosage, pH, and temperature of the solution using Fe–CCRB were studied. Various isotherms and kinetic models were fitted with experimental data to describe the behavior of diffusion mechanism, solute interaction, and nature of adsorption with the adsorbent through batch studies. Mass transfer and thermodynamic characteristics were also evaluated. Regeneration studies were attempted to check the stability and activity of the adsorbent.

Keywords: Rice husk carbon; Iron–loaded chitosan; Adsorption; Mass transfer diffusion; Regeneration