Organic dye adsorption on activated carbon derived from solid waste

ABSTRACT

Activated carbon was prepared through a chemical activation of bamboo waste precursor (BMAC) using phosphoric acid as the activating agent at 500°C for 2 h. Batch adsorption studies were carried out for the adsorption of C.I. Reactive Black 5 (RB5) onto the BMAC. The effect of various experimental parameters such as initial dye concentration (50–500 mg/L), contact time (0–32 h), pH (2–12), and temperature (30–50°C) were investigated. Equilibrium data were found to be very well represented by the Freundlich isotherm and a pseudo-second-order model was found to explain the kinetics of RB5 adsorption more effectively. The mechanism of the adsorption process was determined by the intraparticle diffusion model. Thermodynamic parameters such as standard enthalpy (ΔH°), standard entropy (ΔS°), standard free energy (ΔG°), and activation energy were determined. The results indicated that BMAC is a suitable adsorbent material for adsorption of reactive dye from aqueous solutions.

Keyword: Bamboo waste; Activated carbon; C.I. Reactive Black 5; Isotherm; Kinetics