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FAST AND ECONOMICALLY VIABLE REMOVAL OF A CATIONIC DYE FROM AQUEOUS SOLUTIONS: KINETIC AND EQUILIBRIUM MODELLING

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Abstract

Adsorption of a cationic dye, methylene blue, from aqueous solutions by using sawdust (without any modification) by batch adsorbers was investigated. The surface characterization of the saw dust was carried out by Fourier transform infrared (FTIR) and scanning electron microscopy (SEM) and pHzpc of the surface was also determined. Effects of different parameters such as contact time and initial concentration, temperature and pH on the process of removal were studied. The process of removal was found to be very fast and equilibrium was established in 35 min. The maximum removal efficiency obtained was 94.47 % at pH 3.0, 30 ^{o}C, 20 mg L^{-1} initial concentration and a 10 g/l adsorbent dose. The mechanism for the removal of dye from aqueous solutions was investigated. The maximum removal of methylene blue was obtained at pH 3.0. The kinetic data was in close agreement with pseudo-second-order than pseudo-first-order expression for the removal of methylene blue onto sawdust. Equilibrium isotherms were analyzed by Langmuir and Freundlich adsorption models. Values of the thermodynamic parameters namely changes in free energy (ΔG^{o}), enthalpy (ΔH^{o}) and entropy (ΔS^{o}) for the process of removal have been determined. The results indicate that sawdust could be effectively employed as adsorbent material for the removal of methylene blue from aqueous solutions.

Key words: Adsorption, cationic dye, isotherm, kinetics, sawdust, thermodynamic parameters

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