



ADSORPTION OF DYE FROM AQUEOUS SOLUTION USING SILVER WOOD SAWDUST CARBON

Ponnusamy SenthilKumar^{1*}, Rangasamy Gayathri², Selvaraj DineshKirupha³,
Palanichamy RajKumar³, Jagadesh Nandagopal⁴, Subramanian Sivanesan³

¹Sri Sivasubramaniya Nadar College of Engineering, Department of Chemical Engineering, 603 110 Chennai, India

²VLB Janakiammal College of Engineering and Technology, Department of Civil Engineering, 641 042 Coimbatore, India

³Environmental Management Laboratory, AC Tech, Anna University-Chennai, 600 025, India

⁴Department of Chemistry, Velammal Engineering College, 600 066 Chennai, India

Abstract

Batch adsorption experiments were carried out for the removal of Direct Blue 2B (DB2B) from aqueous solution using newly prepared silver wood sawdust carbon. The operating variables studied are the solution pH, adsorbent dose, initial dye concentration and contact time. The dye removal is pH dependent and reaches a maximum at 3 or below. The experimental data were analyzed by the Langmuir, Freundlich, Temkin and Dubinin-Radushkevich isotherm equations using nonlinear regression analysis. Equilibrium data fitted well with the Langmuir model. The kinetic study showed that pseudo-second-order rate equation better described the adsorption process. Kinetic parameters, rate constants, equilibrium sorption capacities and related correlation coefficients, for each kinetic model were calculated and discussed. The adsorption process was found to be controlled by both surface and pore diffusion, with surface diffusion at the earlier stages followed by pore diffusion at the later stages. Analysis of adsorption data using a Boyd kinetic plot confirms that external mass transfer is the rate determining step in the sorption process. The results indicate that the silver wood sawdust carbon could be employed as a low cost alternative to commercial activated carbon in the removal of dyes from wastewater.

Key words: adsorption, isotherms, kinetics, removal, silver wood sawdust carbon

Received: November 2009; *Revised final:* January, 2011; *Accepted:* January, 2011

* Author to whom all correspondence should be addressed: e-mail: senthilkumar@ssn.edu.in, senthilchem8582@gmail.com;
Phone: +91 44 32909855; Fax: +91 44 27475063; Mobile: +919884823425