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ORIGINAL ARTICLE

A new alternative adsorbent for the removal of cationic dyes from aqueous solution

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Abstract Adsorption of Malachite green (MG) and Methylene blue (MB) from aqueous solutions on low cost adsorbent prepared from *Annona squmosa* seed (CAS) is studied experimentally. Results obtained indicate that the removal efficiency of Malachite green and Methylene blue at 27 ± 2 °C exceeds 75.66% and 24.33% respectively, and that the adsorption process is highly pH-dependent. Results showed that the optimum pH for dye removal is 6.0. The amount of dye adsorbed from aqueous solution increases with the increase of the initial dye concentration. Smaller adsorbent particle adds to increase the percentage removal of Malachite green and Methylene blue. The equilibrium data fitted well to the Langmuir model ($R^2 > 0.97$) and the adsorption kinetic followed the pseudo-second-order equation ($R^2 > 0.99$). The maximum adsorption capacities of MG, MB on CAS are 25.91 mg g^{-1} and 08.52 mg g^{-1} respectively. These results suggest that *A. squmosa* seed is a potential low-cost adsorbent for the dye removal from industrial wastewater. The adsorption capacity of CAS on MG is greater than MB.

1. Introduction

More than 10,000 dyes have been widely used in textile, paper, rubber, plastics, leather, cosmetic, pharmaceutical, and food industries, which generated huge volume of wastewater every year (Mondal, 2008). The disposal of dye wastewater without proper treatment is a big challenge and has caused harm to the aquatic environment, such as reducing light penetration and photosynthesis (Garcia-Montano et al., 2008). Some of dyes contained in wastewater even decompose into carcinogenic aromatic amines under anaerobic conditions, which could cause serious health problems to humans and animals (Chen et al., 2003). Due to the complex molecular structure, dyes are usually very difficult to be biodegraded, making them hardly eliminated under natural aquatic environment (Kar et al., 2009).

Due to the low biodegradability, conventional biological wastewater treatment processes are not efficient in treating

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