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Simulation of Adsorption Kinetics of Malachite Green onto Activated Carbon

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Abstract

In this work, activated carbon was produced from residue of fruit of Sapindus and used for the application of adsorption removal of malachite green dye from simulated aqueous solution. Adsorption kinetics of malachite green onto actived carbon was studied in a batch system. The effects of pH and contact time were examined. The malachite green maximum adsorption occurred at pH 6 (4.5 mg/g) and the lowest adsorption occurred at pH 2 (4.1 mg/g). The apparent equilibrium was reached after 120 min. Optimal experimental conditions were determined. In order to determine the best-fit-adsorption Kinetics, the experimental data were analyzed using pseudo-first-order, pseudo-second-order, pseudo-third-order, Esquivel, and Elovich models. Linear regressive and non-linear regressive methods were used to obtain the relative parameters. The statistical functions were estimated to find the suitable method which fit better the experimental data. Both methods were suitable to obtain the parameters. The non-linear pseudo-first-order model was the best to fit the equilibrium data. The present work showed that activated carbon can be used as a low cost adsorbent for the malachite green removal from water.

Keywords: Activated carbon (AC), malachite green (MG), linear, non-linear regression.

Introduction

Malachite green (MG) is used in coloring paper, dyeing cottons, wools, silk, leather and coating for paper stock. The treatment of effluents containing such dyes is of great interest due to their harmful impacts on receiving waters [1]. The best efficient method used for the quickly removal of dyes from the aqueous solution is the physical adsorption [2]. Aromatic solutes showed slighty better adsorption than aliphatic solutes, due to the potential to form $\pi - \pi$ bonds with the basal planes of activated carbon. No significant influence of solute charge or size was observed [3]. This work aims to understand the potential of activated

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