Abstract

iMedPub Journals

www.imedpub.com

Nano Research & Applications

ISSN 2471-9838

2021

Vol.7 No.S3

Activated carbon decorated with grape stalks powder for methylene blue adsorption from aqueous solutions

R. Davarnejad *

Department of Chemical Engineering, Faculty of Engineering, Arak University, Arak 38156-8- 8349, Iran

Abstract

In this study, activated carbon was combined with grape stalks powder to adsorb methylene blue (MB) dye with various concentrations from a wastewater. Five independent items including pH (2–13), contact time (5–270 min), grape stalks powder dosage (0.1–10 g/ l), methylene blue initial concentration (20–300 mg/l), and activated carbon dosage (0.1–10 g/l) in methylene blue adsorption process were investigated. The Central Composite Design (CCD) under Response Surface Methodology (RSM) was applied to assess the independent variables effects on the methylene blue adsorption. The pseudo-first order, pseudo-second order, Elovich and intraparticle diffusion models were employed to study the adsorption process kinetics. The Langmuir, Freundlich, Temkin and Dubinin-Radushkevich isotherm models were applied to consider the adsorption isotherm. It was concluded that the intraparticle diffusion isotherm and pseudo-second order kinetic models could show the best results in this research and The Langmuir isotherm model could validate the adsorption process isothermal behavior which was monolayer and homogeneous. Pursuant to the Freundlich model data, grape stalks powder blended with activated carbon was an great adsorbent for the MB adsorption because 1/n was equal to 0.1672 ($0 < 1/n < 1$ for an excellent adsorbent). The data analysis indicate that the adsorbent capacity was dramatically increased for the activated carbon (as base adsorbent) blended with grape stalks powder. In addition, some data such as physical adsorption (by analyzing FTIR and applying some standard equations) and mean free energy (E =0.572) were discovered, as well. Finally, activated carbon decorated with grape stalks powder was found as an eco-friend adsorbent for the methylene blue (and the other cationic dyes) reduction from aqueous wastewaters.

Biography:

Reza Davarnejad works as a Associate at Arak University, which is a Colleges & Universities company with an estimated 79 employees; Reza is currently based in Arak, Iran.

Email: r-davarnejad@araku.ac.ir