

Accepted Manuscript

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PII: S0167-7322(16)34245-3
DOI: doi: [10.1016/j.molliq.2017.04.033](https://doi.org/10.1016/j.molliq.2017.04.033)
Reference: MOLLIQ 7186

To appear in: *Journal of Molecular Liquids*

Received date: 28 December 2016
Revised date: 10 April 2017
Accepted date: 11 April 2017

Please cite this article as: Haq Nawaz Bhatti, Asma Jabeen, Munawar Iqbal, Saima Noreen, Zuber Naseem, Adsorptive behavior of rice bran-based composites for malachite green dye: Isotherm, kinetic and thermodynamic studies. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Molliq(2017), doi: [10.1016/j.molliq.2017.04.033](https://doi.org/10.1016/j.molliq.2017.04.033)

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Adsorptive behavior of rice bran-based composites for malachite green dye: Isotherm, kinetic and thermodynamic studies

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Abstract

Rice bran (RB) composites were prepared polyaniline, starch, polypyrrole, chitosan aniline and chitosan pyrrole and employed for the adsorption of Malachite green (MG) dye. Composites doses, pH, contact time, MG initial concentration and temperature effects on MG dye adsorption were studied. Native RB, polyaniline, starch, chitosan pyrrole, polypyrrole and chitosan aniline composites showed the maximum MG dye adsorptions of 143.17, 147.47, 140.85, 122.5, 145.03 and 55 (mg/L) for 200 mg/L dye initial concentration, 50 °C temperature, 50-60 min contact time, 0.05 g/L adsorbent doses in the pH range of 5-7, respectively. Pseudo-second-order kinetic model and Freundlich isotherm fitted well to the adsorption data and intraparticle diffusion was the dye adsorption rate limiting step. Thermodynamic study revealed the endothermic and energetically stable adsorption nature MG dye onto RB composites. Results showed that composites have potential for MG adsorption and are potential candidates for the adsorption of dyes from textile wastewater.

Keywords: Composites; Rice bran; Malachite green dye; Kinetics; Isotherms

1. Introduction

Water pollution is one of the serious global issues and among pollutants, dyes from textile industry are the major sources of pollution [1-3]. The wastewater treatment is a

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