Coconut tree bark as a potential low-cost adsorbent for the removal of methylene blue from wastewater


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ABSTRACT

The existing issue was undertaken to evaluate the potentiality of coconut tree bark (CTB) to remove methylene blue (MB) dye from aqueous solutions. Effects of a variety of process parameters such as pH (3–12), initial dye concentration (25–200 ppm), contact time (10–250 min) and adsorbent dosages (0.5–4.0 g/L) were studied and optimized for the CTB–MB system. Langmuir isotherm model was studied and the results were compared with that of Temkin model and found that Langmuir model fits the data best. Adsorption kinetics of the system was carried out and the experimental data were best-fitted with pseudo-second-order kinetic model. The mechanism of MB dye adsorption was studied by intra-particle diffusion model, which points out that the adsorption process has boundary layer effect and mass transfer analysis of the CTB–MB system indicated better transportation of adsorbate from liquid phase to solid phase. Fourier transform infrared results demonstrated possible functional groups that were responsible for adsorption of MB dye on CTB surface. These results revealed the suitability of the locally available CTB as bio-adsorbent for the removal of MB dye from the wastewater.

Keywords: Adsorption; Coconut tree bark; Methylene blue; Kinetics; Isotherm; Diffusion; Mass transfer