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Adsorption behavior of methylene blue on acid-treated rubber (*Hevea brasiliensis*) leaf

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ABSTRACT

The rubber (*Hevea brasiliensis*) leaf is an agricultural waste was chemically treated with H_2SO_4 to be a potential biochar adsorbent for methylene blue (MB) adsorption from aqueous solution. The acid-treated rubber leaf (ATRL) was characterized by a CHNS-O, Brunauer-Emmett-Teller (BET), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), scanning electron microscope with an energy dispersive X-ray spectrometer (SEM-EDX), *point-of-zero charge* (pH_{PZC})and proximate analyses. Batch mode adsorption studies were conducted by varying operational parameters such as adsorbent dosage (0.02–0.30 g), solution pH (3–11), initial MB concentrations (50–300 mg/L) and contact time (0–1440 min). The equilibrium data were well fitted to Freundlich isotherm compare to Langmuir and Temkin isotherms. The maximum adsorption capacity, q_{max} of ATRL for MB adsorption was 263.2 mg/g at 303 K. The kinetic uptake profiles were well described by the pseudo-second-order model. The thermodynamic adsorption parameters such as standard enthalpy (ΔH°), standard entropy (ΔS°), and standard free energy (ΔG°) showed that the adsorption of MB onto ATRL surface endothermic in nature and spontaneous under the experimented conditions. All results mentioned above revealed that the ATRL can be feasibly utilized for the removal of MB from aqueous solution.

Keywords: Rubber leaf; Acid-treated; Chemical activation; Sulphuric acid; Adsorption; Methylene blue

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