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Adsorption of Malachite Green Dye on Graphene Oxide Nanosheets from Aqueous Solution: Kinetics and Thermodynamics Studies

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Abstract : In this study, graphene oxide (GO) nanosheets have been synthesized and characterized using different spectroscopic tools such as X-ray diffraction spectroscopy, infrared Fourier transform (FT-IR) spectroscopy, BET specific surface area and Transmission Electronic Microscope (TEM). The prepared GO was investigated for the removal of malachite green, a cationic dye from aqueous solution. The removal methods of malachite green has been proceeded via adsorption process. GO nanosheets can be predicted as a good adsorbent material for the adsorption of cationic species. The adsorption of the malachite green onto the GO nanosheets has been carried out at different experimental conditions such as adsorption kinetics, concentration of adsorbate, pH, and temperature. The kinetics of the adsorption data were analyzed using four kinetic models such as the pseudo first-order model, pseudo second-order model, intraparticle diffusion, and the Boyd model to understand the adsorption behavior of malachite green onto the GO nanosheets and the mechanism of adsorption. The adsorption isotherm of adsorption of the malachite green onto the GO nanosheets has been investigated at 25, 35 and 45 °C. The equilibrium data were fitted well to the Langmuir model. Various thermodynamic parameters such as the Gibbs free energy (ΔG°), enthalpy (ΔH°), and entropy (ΔS°) change were also evaluated. The interaction of malachite green onto the GO nanosheets has been investigated by infrared Fourier transform (FT-IR) spectroscopy.

Keywords : adsorption, graphene oxide, kinetics, malachite green
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