

Eucalyptus bark powder as an effective adsorbent: Evaluation of adsorptive characteristics for various dyes

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ABSTRACT

Dyes are usually present in trace quantities in the treated effluents of many industries. This study investigates the potential use of eucalyptus bark powder (EBP) as an adsorbent for adsorption of industrially important dyes namely malachite green, indigo carmine and methylene blue from wastewater. The operating variables studied are initial dye concentration, pH, temperature and contact time. It was noted that adsorption of all the dyes on eucalyptus bark powder increases with an increase in pH and temperature. The equilibrium data are fitted to Langmuir in comparison to Freundlich isotherm equations. From these results adsorption efficiency, energy, capacity, intensity and dimensionless separation factor are also calculated. Adsorption isotherm modeling shows that the interaction of the dyes with eucalyptus bark powder surface is localized monolayer adsorption. The adsorption of all the three dyes followed the pseudo-second order rate kinetics, Bangham's equation was also used to further check the kinetic model. On the basis of kinetic studies, various rate and thermodynamic parameters such as Gibbs free energy, enthalpy and entropy were evaluated. Influence of temperature on the removal of dye from aqueous solution shows the feasibility of adsorption and its endothermic nature. The results of the study shows that the eucalyptus bark powder can be used as a potential adsorbent for dyes in wastewater/water.

Keywords: Waste treatment; Colorants; Biosorption; Biomass; Thermodynamics; Kinetics

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