Adsorption of direct green 26 onto fix 3500 treated sawdust: equilibrium, kinetic and isotherms

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ABSTRACT

Cationized sawdust (CSD) was prepared by the reaction of sawdust (SD) with cationizing agent. Three levels of CSD having different nitrogen content were prepared. The CSD samples were characterized by estimation of nitrogen content. The feasibility of CSD to remove C.I. Direct Green (DG 26) dye from aqueous solutions was examined. The impacts of several operating parameters such as adsorbent dose, adsorption time, and adsorbate concentration on the adsorption capacity were investigated. The CSD was effectively used in adsorption of DG 26 dye from aqueous solutions. In order to determine the best fit isotherm, the experimental equilibrium data were analyzed using eight adsorption isotherm models including Langmuir, Freundlich, Temkin, and Dubinin–Radushkevich (two parameter models), Redlich–Peterson, Toth, Sips and Khan (three parameter models) using non-linear regression technique. Tempkin and Sips isotherms were found to best represent the data for DG 26 dye than other isotherms. The kinetics of adsorption of DG 26 dye have been discussed using six kinetic models, i.e., the pseudo-first-order model, the pseudo-second-order model, Batacharia–Venkobachar, the Elovich equation, the intraparticle diffusion model, and Bangham equation. The removal of DG 26 dye onto CSD particles could be well described by the pseudo–second-order model. CSD dye was found to be inexpensive and effective adsorbent for removal of DG 26 dye from aqueous solutions.

Keywords: Sawdust; Direct green 26; Adsorption isotherm; Cationized sawdust; Wastewater treatment

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