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ADSORPTION OF METHYLENE BLUE DYE ONTO SURFACE MODIFIED CASHEW NUT SHELL

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Abstract

In the present study, batch adsorption experiments were performed for the removal of methylene blue (MB) dye from its aqueous solution using newly prepared surface modified cashew nut shell (SMCNS) by varying the operating parameters like solution pH, adsorbent dose, initial dye concentration, contact time and temperature. The SMCNS has been prepared by treating the cashew nut shell with the sulphuric acid. Adsorption equilibrium data were analyzed by the model equations such as Langmuir, Freundlich, Temkin and Dubinin-Radushkevich isotherms and it was found that the Freundlich isotherm model best fitted the equilibrium data. The maximum monolayer adsorption capacity of the SMCNS was found to be 71.33 mg of MB dye molecules / g of SMCNS. A single stage batch adsorber was designed using Freundlich adsorption isotherm model. Kinetic models such as pseudo-first-order, pseudo-second-order, Elovich, intra particle diffusion, and Boyd kinetic model were applied to describe the adsorption mechanism and the results shows that pseudo-second-order equation fits the kinetic data very well. Thermodynamic studies reveal that the adsorption of MB dye onto the SMCNS is spontaneous and exothermic in nature. This study shows that surface modified cashew nut shell is a potential low cost adsorbent and can be an alternative to the commercially available adsorbents.

Key words: adsorption, mechanism, methylene blue, process design, SMCNS

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