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Preparation of Activated Carbon from Lignocellulosic Precursor for Dyes Adsorption

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Abstract : The synthesis and characterization of activated carbon from local lignocellulosic precursor (Algerian alfa) was carried out for the removal of cationic dyes from aqueous solutions. The effect of the production variables such as impregnation chemical agents, impregnation ratio, activation temperature and activation time were investigated. Carbon obtained using the optimum conditions (CaCl2/ 1:1/ 500°C/2H) was characterized by various analytical techniques scanning electron microscopy (SEM), infrared spectroscopic analysis (FTIR) and zero-point-of-charge (pHpzc). Adsorption tests of methylene blue on the optimal activated carbon were conducted. The effects of contact time, amount of adsorbent, initial dye concentration and pH were studied. The adsorption equilibrium examined using Langmuir, Freundlich, Temkin and Redlich–Peterson models reveals that the Langmuir model is most appropriate to describe the adsorption process. The kinetics of MB sorption onto activated carbon follows the pseudo-second order rate expression. The examination of the thermodynamic analysis indicates that the adsorption process is spontaneous ($\Delta G^\circ < 0$) and endothermic ($\Delta H^\circ > 0$), the positive value of the standard entropy shows the affinity between the activated carbon and the dye. The present study showed that the produced optimal activated carbon prepared from Algerian alfa is an effective low-cost adsorbent and can be employed as alternative to commercial activated carbon for removal of MB dye from aqueous solution.

Keywords : activated carbon, adsorption, cationic dyes, Algerian alfa
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