

## Abstract

The preparation of activated carbon from apricot stone (ASAC) activated with  $H_3PO_4$  and its ability to remove the basic dye Congo red (CR) used in the textile industry in aqueous solution are reported in this study. The FTIR spectroscopy is used to get information on the interactions between the ASAC adsorbent and CR. A series of contact time experiments were undertaken in stirred batch to assess the effect of the system variables. The results showed that ASAC can be successfully used the wastewater treatment. A comparison of two models on the overall adsorption rate showed that the kinetic of adsorption was better described by the pseudo-second order model. The adsorption data of CR onto ASAC are determined and correlated with common isotherms equations. The small values of the Root Mean Square Error (RMSE) obtained for the Langmuir and Dubinin–Radushkevich models indicate the best fitting of the curves. The monolayer adsorption capacity of CR is found to be  $32.85 \text{ mg g}^{-1}$  at  $25 \text{ }^\circ\text{C}$  and  $23.42 \text{ mg g}^{-1}$  at  $65 \text{ }^\circ\text{C}$  at  $\text{pH} \sim 13$ . The thermodynamic parameters indicate a spontaneous and endothermic nature of the adsorption process. The positive entropy ( $\Delta S^\circ$ ) shows that the randomness increases at the solid–solution interface during the CR adsorption, indicating that some structural exchange occurs among the active sites of the adsorbent and CR molecules