



Investigation of equilibrium, kinetics and thermodynamics of extracted chitin from shrimp shell in reactive blue 29 (RB-29) removal from aqueous solutions

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ABSTRACT

The presence of reactive dyes in aqueous medium cause many problems; therefore, it is necessary to reduce its content in industrial effluents before their discharge into environment. The aim of this study was to investigate the removal of reactive blue 29 (RB-29) dye from aqueous solutions using extracted chitin from shrimp shells as an adsorbent. This study was conducted in a batch experimental system. After extraction of chitin from shrimp shells, the effects of different variables such as pH, RB-29 concentration, contact time and adsorbent dose were investigated. Furthermore, adsorption isotherms, thermodynamics and kinetics of the process were also studied. The results of this study showed that the maximum adsorption capacity (q_{\max}) of chitin was 116.07 mg/g at a RB-29 concentration of 50 mg/L and contact time of 90 min. In addition, the maximum adsorption was observed at pH = 3 and adsorbent dosage of 0.2 g/L. The experimental data showed that the results were consistent with the Langmuir isotherm model. According to the results of thermodynamic study, standard entropy change ΔS is equal to 25.40 J/mol K, standard enthalpy change ΔH is equal to 7,054.39 J/mol and standard Gibbs free energy values (ΔG) were negative, that represents a spontaneous and endothermic process of RB-29 adsorption by the extracted chitin. Moreover, adsorption kinetics followed the pseudo-second-order kinetic model. Based on the results of this study it can be concluded that chitin can efficiently remove RB-29 dye from aqueous solutions.

Keywords: Reactive blue 29; Chitin; Adsorption; Isotherms; Thermodynamics; Kinetics

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