Optimization and evaluation of reactive dye adsorption on magnetic composite of activated carbon and iron oxide

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\textbf{ABSTRACT}

In this study, the magnetic-activated carbon (MAC) was synthesized and employed as an adsorbent for removing Reactive Blue 5 from aquatic environments. Physical properties and surface morphology of the MAC were analyzed using the transmission electron microscopy, scanning electron microscopy (SEM), SEM–energy dispersive analysis by X-ray, X-ray diffraction, vibrating sample magnetometer and Brunauer–Emmett–Teller techniques. The adsorption efficiency of dye was studied in a batch experiment by investigating the influential parameters such as pH, contact time, adsorbent dosage, initial dye concentration, and temperature. Various models of isotherm and kinetic were used to evaluate the obtained data. The equilibrium time was found to be 15 min. The thermodynamic values indicated that the adsorption process was spontaneous and endothermic. The adsorption isotherms and kinetics follow the Langmuir ($R^2 > 0.999$) and pseudo-second-order models ($R^2 > 0.995$), respectively. On conclusion, MAC due to its quick and easy isolation, not leading to the secondary pollution and high efficiency, is a very suitable adsorbent for dye removal from aquatic media.

\textit{Keywords:} Magnetic composite; Fe$_3$O$_4$ nanoparticles; Activated carbon; Adsorption; Reactive Blue 5

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