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Removal of anionic dye from aqueous solution using magnetic clay

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Abstract

In the present study, the polyethylenimine (PEI) functionalized magnetic montmorillonite clay was prepared by a hydrothermal method. The formed nanocomposite was employed to removal of Safranin. The structure properties and morphology of the prepared nanocomposite were characterized by scanning electron microscopy, Fourier transform infrared spectroscopy and vibrating sample magnetometer. The effect of several parameters including dye concentration, adsorbent dosage and contact time was examined to optimize the conditions for maximum removal of dye. Equilibrium data and isotherm constants were evaluated using Freundlich and Langmuir models. The maximum adsorption capacity under optimal conditions was calculated 119.0 mg g^{-1} . Kinetic data were analyzed using the first-order and second-order Lagergren equations. The pseudo-second-order kinetic model was fitted ($R^2 = 0.9994$), which indicates that removal of Safranin could be controlled by the chemical adsorption process. This study shows that the prepared nanocomposite can be utilized as an efficient and magnetically separable sorbent for the environmental treatment.

Keywords: Clay, Magnetic Adsorbent, Nanocomposite, Removal, Safrani

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