Adsorptive removal of methyl orange using enhanced cross-linked chitosan/bentonite composite

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ABSTRACT

In this study, the cross-linked chitosan/bentonite composite was treated further with concentrated HCl. The resultant composite was referred to as the enhanced cross-linked chitosan/bentonite (ECCS/BT) composite, which was characterized by X-ray diffraction, scanning electron microscopy, and Fourier transform infrared spectroscopy techniques. ECCS/BT composite was used as an adsorbent to remove an anionic dye, methyl orange (MO), from aqueous solutions by a batch method. Various conditions were evaluated, including acid treatment, the ratio of chitosan to bentonite, initial MO concentration, adsorbent dosage, solution pH, and contact time. The adsorption kinetics and equilibrium isotherms of MO by the ECCS/BT composite were studied using the pseudo-first-order and pseudo-second-order kinetic models as well as Freundlich and Langmuir isotherm models. The kinetic data followed the pseudo-second-order equation; the isotherm data were described by the Langmuir isotherm model and the maximum adsorption capacity ($Q_{\text{max}}$) was obtained at 136.8 mg/g at natural pH and 293 K.

Keywords: Enhanced cross-linked chitosan/bentonite composite; Methyl orange; Adsorption; Kinetics

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