



Adsorption of a textile dye Ostazin Black NH from aqueous solution onto chitosan-coated perlite beads

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ABSTRACT

Chitosan-coated perlite beads were prepared by dropwise addition of gel containing chitosan and perlite into a precipitation bath. The structure of the beads was characterized using Fourier transform infrared spectroscopy. The surface area and microstructure of the beads were measured by Brunauer–Emmett–Teller (BET) instrument. The beads that contained chitosan enhanced the accessibility of OH and amine groups for adsorption process. Adsorption of Ostazin Black NH (OB) dye from aqueous solution on chitosan-coated perlite beads was studied using batch adsorption technique, and all parameters influencing the removal efficiency such as amount of adsorbent, pH, temperature and initial dye concentration were investigated. Adsorption of OB ions reached equilibrium concentration in 48 h. An increase in the initial dye concentration and a decrease in the temperature led to an increase in the adsorption amounts of chitosan-coated perlite beads. A decrease in the adsorption amount of OB dye was observed at high pH values. The optimum pH recorded for OB adsorption was 6–7. Experimental data were also evaluated in terms of kinetic characteristics of adsorption, and it was found that adsorption process followed well pseudo-second-order kinetics. Langmuir and Freundlich isotherms were studied for the adsorption data over a concentration range of 20–80 mg/L. Adsorption isotherms were well fitted with the Freundlich model, and the maximum adsorption capacity was 21.11 mg/g. Thermodynamic study was also performed to determine the feasibility of adsorption process. The results of thermodynamic parameters (ΔG° , ΔH° , and ΔS°) showed that the adsorption of OB onto the chitosan-coated perlite beads was exothermic and spontaneous in nature. The chitosan-coated perlite beads are very promising for the removal of dye from wastewater due to their low cost of production and high removal efficiencies.

Keywords: Adsorption; Chitosan; Ostazin Black NH; Perlite

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