Kinetics and isotherm of cationic dye removal from multicomponent system using the synthesized silica nanoparticle

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ABSTRACT

In this paper, silica nanoparticle was synthesized. Dye removal ability of the synthesized silica nanoparticle (SSN) from single and multicomponent (ternary) systems was studied. The SSN was characterized by fourier transform infrared and scanning electron microscopy. Basic Red 18 (BR18), Basic Red 46 (BR46) and Basic Violet 16 (BV16) were used as cationic dyes. The kinetics and isotherm of dye adsorption were studied. The effect of operational parameter such as adsorbent dosage and initial dye concentration was evaluated. Adsorption kinetic of dyes was found to conform to pseudo-second-order kinetics. The maximum dye adsorption capacity ($Q_0$) of SSN for BR18, BR46 and BV16 were 98, 88 and 416 mg/g, respectively. It was found that adsorption of BR18, BR46 and BV16 onto SSN followed with Freundlich isotherm. The results showed that the SSN being an eco-friendly adsorbent might be a suitable alternative to remove cationic dyes from multicomponent systems.

Keywords: Silica nanoparticles; Synthesis; Dye removal; Ternary system; Kinetics and isotherm