Adsorption kinetics of lac dye on silk yarn coated with microcrystalline chitosan

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Abstract: The microcrystalline chitosan (MCCh) coating of silk yarn using the ultrasonic-assisted method showed a significant enhancement of lac dye uptake onto silk yarn compared with the results in the absence of MCCh. The effect of temperature on the adsorption of lac dye on silk yarn pre-coated with MCCh was investigated at 30, 60, and 80 °C. Before the equilibrium time, the initial dye adsorption ($h_i$) increased with increasing temperature which reflected a kinetically controlled process. This result is consistent with the expected increase in the rate of dye diffusion with temperature and the increased rate of movement of dye molecules within the fibre. After the equilibrium time, the decrease in the amount of the dye adsorbed per gram of silk with increasing temperature indicated that the adsorption of lac dye on silk coated with MCCh was controlled by an exothermic process. The adsorption kinetics of lac dye on silk yarn coated with microcrystalline chitosan (1.0 %w/v) was investigated in a batch system. It was found that the experimental data fitted well to the pseudo second-order kinetic model with an activation energy of 30.2 kJ/mol.

Keywords: Lac dye; Adsorption kinetics; Microcrystalline chitosan