

Adsorption of anionic dye using cationic surfactant - modified kenaf core fibers

ABSTRACT

Kenaf is a widely cultivated crop, particularly in the tropics. Kenaf core fiber (KCF) is a natural cellulose fiber derived from the plant and it is an important raw material for a variety of products. An attempt was made to chemically quaternized KCF (QKCF) as an adsorbent to increase adsorption affinity towards anionic reactive red-RB dye (RR). KCF was quaternized by treating with (3-chloro-2-hydroxypropyl) trimethylammonium chloride under basic condition. The efficiency of QKCF was investigated by adsorption studies for removing anionic RR dye from aqueous solutions. All experiments were conducted at a batch system and influential parameters cover pH, adsorbent dose, initial dye concentration, agitation speed, temperature, and contact time were investigated. Studies showed that removal efficiency of RR dye increases with increasing the adsorbent dose, agitation speed, temperature, and contact time. The equilibrium data were best represented by the Langmuir isotherm model with maximum adsorption capacity of 169.5 mg/g, and the kinetic data were found to follow the pseudo-second-order kinetic model. In general, QKCF could be suggested as an efficient and low-cost adsorbent for removal anionic dyes.

Keyword: Adsorption; Kenaf core fiber; Reactive red dye; Anionic dye; Quaternization