

## **Equilibrium, kinetics and thermodynamic adsorption studies of acid dyes on adsorbent developed from kenaf core fiber**

### **ABSTRACT**

Quaternized kenaf core fiber (QKCF) was used as an adsorbent for adsorption of anionic Acid Blue-25 (AB) and anionic Acid Green-25 (AG) dyes. Chemical treatment with (3-chloro-2-hydroxypropyl) trimethylammonium chloride under basic condition was applied in order to alter the surface properties of the raw kenaf core fiber. Adsorption studies were carried out to delineate the effect of initial dye concentration, temperature and pH on removal of dyes. The results show that the percentage removal of Acid Blue-25 and Acid Green-25 dyes were increased by increasing the concentrations of dyes. In addition, the maximum percentage removal was 99.8% and 99.65% for Acid Blue-25 and Acid Green-25, respectively. Langmuir, Freundlich and Temkin isotherm models were applied to analyze the data for dye adsorption at 15°C, 25°C, 35°C, and 45°C. The experimental data were best represented by the Langmuir model with maximum adsorption capacity of 303.03 mg/g and 344.83 mg/g for Acid Blue-25 and Acid Green-25 dyes, respectively, at 15°C, and the kinetic data for both dyes were best represented by the pseudo-second-order kinetic model. Thermodynamic studies indicated that the reactions of Acid Blue-25 and Acid Green-25 dyes were endothermic. It was concluded that QKCF adsorbent can be utilized as an efficient low-cost adsorbent for removal of anionic dyes.

**Keyword:** Adsorption; Kenaf core fiber; Acid dye; Acid blue dye; Acid green dye; Quaternization