

Photodegradation of indigo dye using TiO₂ and TiO₂/zeolite system

Abstract

Photodegradation of indigo dye in aqueous solution using anatase TiO₂ and TiO₂/zeolite composite photocatalyst were studied. The composite photocatalysts were prepared by using sol-gel method. Calcination sol-gel was performed in a muffle furnace at 450 °C for 4 h. The photocatalysts were characterized using SEM and XRD. 0.4 g of photocatalysts were used to degrade 500 mL of indigo dye giving a constant catalyst loading of 0.8 g/L in varying indigo dye concentration of between 10-20 mg/L. The results showed that the photocatalytic behaviour of TiO₂/zeolite composite sample was better as the degree of degradation for TiO₂/zeolite was higher compared to the neat TiO₂ sample. The percentage degradation achieved by using TiO₂/zeolite in 10 and 20 mg/L were 58.6 and 75.0 % respectively. In addition, the degradation process followed the first-order reaction kinetics where the rate constant, k , for the degradation of indigo dye solution was in the range of 0.1207-0.2669 h⁻¹ (not presented). This work demonstrates that the sol-gel method was successful in preparing an effective TiO₂/zeolite composite photocatalyst.