A comparison of sorption and photodegradation study in the removal of basic and reactive dyes

ABSTRACT

A comparative study on the effectiveness of using ethylenediamine modified rice hull (MRH) and titanium dioxide (TiO2) under ultraviolet irradiation to remove both basic and reactive dyes from aqueous solutions was carried out. The sorption characteristics of Basic Blue 3 (BB3) and Reactive Orange 16 (RO 16) by MRH were studied under various experimental conditions. Studies on the sorption of both dyes showed that sorption was pH and concentration dependent. Langmuir equation was employed to model the sorption behavior of MRH. Maximum sorption capacities calculated from the Langmuir model are 3.29 and 24.88 mg/g for BB3 and RO16, respectively. The effect of initial concentrations as well as light source was carried out in the photodegradation of BB3 and RO16. BB3 with concentration of 50 mg/l was totally degraded after 6 hours of contact with TiO2 under UV illumination whereas RO 16 at the same concentration was completely decolorized at illumination time of 5 hours. The decolorizing efficiency decreased with increasing dye concentration and a higher efficiency was obtained under solar light illumination.

Keyword: Basic dyes; Photodegradation; Reactive dyes; Sorption