

11th Annual Congress on
CHEMISTRY
September 12-13, 2018 Singapore

Sonophotocatalytic degradation of textile dyes using copper impregnated Al_2O_3 under visible light Irradiation

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Visible-light-driven photocatalyst was prepared by wet Impregnation method. The prepared photocatalyst was characterized with different spectroscopic techniques. Copper impregnated alumina ($\text{Cu}-\text{Al}_2\text{O}_3$) photocatalyst was used for Sonophotocatalytic degradation of two textile dyes, Acid Red 27 (AR-27) and Direct Violet 51 (DV-51). Effect of parameters such as pH, photocatalyst dosage, oxidizing agents, dye concentration, scavengers, photocatalyst re-used ability and catalyst poisoning were investigated. The catalytic degradation of AR-27 increased from 26.8% to 85.1% and DV-51 increased from 23.9% to 84.6% with 8 mmol of hydrogen peroxide. At pH 10, the sonophotocatalytic degradation of AR-27 was 100% in 50 minutes and DV-51 was 100% in 60 minutes. It was found that scavengers increased the degradation time and decreased the percent removal of AR-27 from 100% in 50 minutes to 81.8% in 60 minutes. Catalyst reusability was checked and up to five-time use good results were achieved. Kinetics study was also carried out and found that both of the dyes undergo first order kinetic model. All the experiments revealed that the Sonophotocatalytic Degradation method in the presence of $\text{Cu}-\text{Al}_2\text{O}_3$ is a suitable option for the treatment of textile effluents in the presence of visible light.

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