

Ultrasonic assisted photolytic degradation of Reactive Black 5 (RB5) simulated wastewater

ABSTRACT

The present study is based on a hybrid advanced oxidation process (AOP) of sonophotolysis system, of which sonication (35 kHz) and photolysis UV-C (254nm) were applied simultaneously to effectively degrade a selected recalcitrant dye-based pollutant, Reactive Black 5 (RB5). The influence of the solution pH and concentration were manipulated throughout this study to investigate the sonophotodegradation kinetics and synergistic effects on the RB5 degradation. Increasing the solution concentration resulted in lowered degradation rate due to the inner filter effect by the dye molecules and reduced the generation of hydroxyl radicals. The results confirmed that the sonophotolysis rate was better at basic medium (67.7%) in comparison to acidic medium (46.9%) due to the ionization of RB5. Synergistic effects were analyzed based on the first order kinetic rate model. It was found that the synergistic effect was observed for all the experiments conducted which resulted from an increase in the ($\bullet\text{OH}$) radicals due to the photolysis of H_2O_2 formed by the sonolysis process. This hybrid system, sonophotolysis system, was able to degrade RB5 into intermediates with a total reaction time of 1h.