



Photocatalytic degradation of azo dye Reactive Red 15 over synthesized titanium and zinc oxides photocatalysts: a comparative study

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ABSTRACT

Nanoparticle TiO₂ and ZnO were prepared by facile method. The XRD pattern study shows that there is no obvious difference in crystal composition of various shapes of TiO₂ and ZnO. The photocatalytic degradation of Reactive Red 15, commonly used as a textile dye, using synthesized titanium and zinc oxides was investigated. The effects of influential parameters such as initial pH, catalyst loading, initial dye concentration and addition of hydrogen peroxide were studied. The degradation efficiency was expressed by the removal of color and chemical oxygen demand (COD). The study reveals that: (1) Both catalysts, under corresponding optimal conditions, can be employed as an effective photocatalyst for the elimination of color and COD from dye wastewater. Also, ZnO is more efficient catalyst than TiO₂; (2) Addition of proper amount of hydrogen peroxide improves both the decolorization and the degradation of the dye; (3) The photocatalytic degradation of Reactive Red 15, in the presence of both photocatalysts, obeyed pseudo-first order kinetics. The biodegradability ratio BOD₅/COD increases from original zero up to 0.52 and 0.6 within 90 minutes irradiation time using 1 and 0.75 g/L TiO₂ and ZnO, respectively.

Keywords: Nanoparticle, Photocatalytic oxidation, Titanium dioxide, Zinc oxide, Azo dyes, Reactive Red 15, Biodegradability

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