

Performance of self-cleaning cotton textiles coated with TiO_2 , $\text{TiO}_2\text{-SiO}_2$ and $\text{TiO}_2\text{-SiO}_2\text{-HY}$ in removing Rhodamine B and Reactive Red 120 dyes from aqueous solutions

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ABSTRACT

In the present study composites based on TiO_2 nanoparticles, SiO_2 and HY zeolite were synthesized by using a standard sol-gel methodology and analyzed by Fourier-transform infrared spectroscopy, X-ray diffraction and scanning electron microscopy-energy-dispersive X-ray spectroscopy techniques. The photocatalysts were impregnated on cotton textiles and their photocatalytic abilities were examined by degradation of Rhodamine B (RhB) and Reactive Red 120 (RR120) dyes in aqueous solution under similar solar irradiation. RhB removal efficiencies from cotton textiles were 87%, 72% and 50% for TiO_2 , $\text{TiO}_2\text{-SiO}_2\text{-HY}$ zeolite and $\text{TiO}_2\text{-SiO}_2$ composites, respectively and achieved after 3 h of light irradiation. However, for the RR120 dye, the reached result was different as the photodegradation for this dye (65% efficiency) was only observed in bare TiO_2 functionalized textile. In addition, for the treatment with $\text{TiO}_2\text{-SiO}_2\text{-HY}$ zeolite, it was found that for initial alkaline conditions at pH of the RhB dye solution, the photodegradation rate decreased.

Keywords: TiO_2 ; Photocatalysis; Environmental remediation; RhB dye; Reactive Red 120 dye

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