Photocatalytic Degradation of Rhodamine B by TiO$_2$/ZnO Nanofibers Under Visible Light Irradiation

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Photocatalytic reduction of contaminants in wastewater or polluted water can be enhanced by finding a suitable catalyst with property that utilizes an extended light adsorption spectrum, reducing the recombination of electron-hole pairs, and casting the catalyst into a form with large surface-to-volume ratio to be in contact with the contaminants. Based on these objectives, Zn-doped TiO$_2$ nanoparticles with high photocatalytic activity were synthesized by the sol–gel assisted nozzle-less electrospinning technique followed by calcining the precursor Ti(OiPr)$_4$/ZnAc/PVP nanofibers in air in the temperature range of 450-650$^\circ$C. The thermal decomposition behavior was studied by thermogravimetric analyser and differential scanning calorimeter (TGA–DSC), and the morphology and crystal structure were monitored by scanning electron microscopy (SEM) with energy dispersive spectroscopy (EDS) and X-ray diffraction (XRD).

With the different concentration of zinc acetate in the precursor solution, the diameter of fibers ranged from 80-130 nm. The photocatalytic degradation of rhodamine B dye under visible light irradiation was also studied. It is found that the photosensitized degradation activity can be optimized by doping an appropriate amount of Zn (0.30 wt. %). Also, the optimal photocatalyst loading has also been determined. Hence, the enhanced photodegradation of dyes with a new photocatalyst nanofiber under visible irradiation can be realized, which can take better use of solar energy.