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Highly efficient TiO_2/PPy photocatalysts

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Titanium dioxide is the most suitable semiconductor for photocatalytic application due to its high efficiency, increased stability, low-cost, and non-toxicity. However, it is possible to enhance the photocatalytic activity of TiO_2 by homogenizing it with conductive polymers. One of the most attractive conductive polymers is polypyrrole (PPy) owing to its stability, low-cost, and special redox properties. The aim of this work was to obtain the TiO_2/PPy nanocomposites with a higher photocatalytic activity compared to TiO_2. In order to determine the optimal content of PPy, four TiO_2/*x*%PPy samples (x = 0, 1, 3, and 5 wt.%) were synthesized and characterized by XRD and TG/DSC analyses. The photocatalytic activity was examined towards the degradation of toxic textile azo dye Reactive Orange 16. It was observed that an increase in PPy content led to better adsorption capacity of the synthesized nanocomposites. Samples TiO_2/1%PPy and TiO_2/5%PPy demonstrated better photocatalytic activity than TiO_2, while TiO_2/3%PPy showed very similar photocatalytic activity to TiO_2. Near complete degradation of the dye (98 %) was reached in 75 min by using TiO_2/1%PPy, comparing to pure TiO_2, which degraded the same amount of the dye in 120 min. Considering all the obtained results, the optimal content of PPy in the composite for degradation of Reactive Orange 16 is 1 wt.%.