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Detachable photocatalysts of anatase TiO_2 nanoparticles: Annulling surface charge for immediate photocatalyst separation

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The highlights of this paper are:

- Preparation of TiO_2 nanoparticles with small size and significantly large surface area for photocatalytic applications.
- Utilization of the prepared nanocatalyst in the photodegradation of rhodamine 6G dye (R6G) as a model pollutant.
- Separation and isolation of the nanocatalyst from the reaction mixture after the degradation was completed via a simple and extremely effective method. Neutralization of the nanoparticles surface charged caused their aggregation and subsequently formation of large clusters. These cluster rapidly sedimented and were collected using simple filtration setup and recycled for further experiments.

Abstract

Herein, we report the synthesis and characterization of TiO_2 nanoparticles as efficient photocatalysts via a modified sol-gel method. A temperature-dependent study is conducted to evaluate the characteristics of the nanoparticles via XRD, XPS, DLS, UV-Vis, N_2 sorpometry and TEM techniques. The efficiency of the as-prepared photocatalyst is then tested for the photocatalytic degradation of Rhodamine 6G dye (R6G). The study covers a range of pH values and the maximum efficiency reported here is above 92.5% at pH = 9.17. The main focus of this study is to establish a method that can be industrially used to enable the separation of the