



ORIGINAL ARTICLE

Photodegradation of Rhodamine 6G and phenol red by nanosized TiO₂ under solar irradiation

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Abstract Titanium dioxide nanoparticles are used in various applications, including environmental photocatalysis, solar cells and memory devices. In this study, we present the photodegradation of Rhodamine 6G and phenol red, employing heterogeneous photocatalytic process under solar irradiation. The experiments were carried out to study the effects of various parameters (i.e. the effect of the anchoring groups on the catalyst, concentration of the *n*-TiO₂ semiconductor). The *n*-TiO₂ was synthesized by a sol-gel process and characterized by SEM. When samples of *n*-TiO₂ of different sizes were encapsulated with eriochromycine dye the quantum size effect is observed in the visible region of the spectrum. The rate of degradation was estimated from the residual concentration spectrophotometrically. Phenol red showed higher degradation than Rhodamine 6G which can be attributed to its sulfonic and hydroxyl anchoring groups. The photodegradation showed pseudo-first-order kinetics.

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1. Introduction

Many organic compounds are present as pollutants in wastewaters that are emitted from industrial and normal households. These pollutants can be found in ground water wells and surface waters. They can be treated by different processes: adsorption in waste materials (Bousher et al., 1997), electrochemical oxidation (Lopez-Grimau and Gutierrez, 2006), membranes (Arami et al., 2006), coagulation (Papic et al., 2000), Fenton or photo-Fenton oxidation, foam flotation (Lin and Lo, 1996), adsorption using activated carbon (Gomez et al., 2007), combined coagulation/carbon adsorption (Papic et al., 2004). However, these processes are nondestructive and generate secondary pollutants. One way to destroy pollutants without generating secondary toxic materials is photocatalysis.

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