Utilization of reduced graphene oxide for the enhancement of photocatalytic property of TiO₂ nanotube

Huidi Liu, Yaling Wang, Lei Shi, Ruopeng Xu, Langhuan Huang*, Shaozao Tan

Department of Chemistry, Jinan University, Guangzhou 510632, P. R. China, Tel. +86 20 85228817; emails: liuhdjy@163.com (H. Liu), 719658033@qq.com (Y. Wang), 1101465969@qq.com (L. Shi), 289281737@qq.com (R. Xu), Tel./Fax: +86 20 85228817; email: thuanglh@jnu.edu.cn (L. Huang), Tel. +86 20 85223670; email: tanshaozao@163.com (S. Tan)

Received 12 February 2015; Accepted 25 May 2015

ABSTRACT

Photocatalysts based on TiO₂ nanotubes and reduced graphene oxide (TNTs-RGO) were prepared by the hydrothermal method. The resulting TNTs-RGO composite photocatalysts were characterized by X-ray powder diffraction, transmission electron microscopy, diffuse reflection spectrum, Fourier transform infrared spectroscopy, N₂ adsorption–desorption isotherm, and fluorescence spectrum. The photocatalytic activity of TNTs-RGO was investigated through the degradation tests of Rhodamine B (RhB) and Cr(VI) under UV-light irradiation. The results showed that compared with TNTs or TiO₂, TNTs-RGO possessed higher surface area, enhanced optical absorption in the visible-light region and improved separation efficiency of electron–hole pairs, leading to the remarkable increases in adsorption capacity and photocatalytic activity for RhB or Cr(VI), which was thanks to the introduction of RGO. On the basis of the experimental results, a possible photocatalytic degradation mechanism of RhB or Cr(VI) by TNTs-RGO was also proposed. The excellent absorption capacity and photocatalytic activity suggested the great potential applications of TNTs-RGO photocatalyst in environmental problems.

Keywords: TiO₂ nanotube; Reduced graphene oxide; Photocatalytic activity; Adsorption

*Corresponding author.

1944-3994/1944-3986 © 2015 Balaban Desalination Publications. All rights reserved.