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Enhanced Visible Light-driven Photocatalytic Activities of Ag_3PO_4 Modified Electrochemically Anodized TiO_2 Nanotube Arrays

Guangxing Ping[1,2], *Xinyan Wang*[2], *Da Chen*[3,*], *Kangying Shu*[3] *Changsheng Li*[1,*]

[1] School of Material Science and Engineering, Jiangsu University, Zhenjiang, Jiangsu 212013, China
[2] College of Sciences, China Jiliang University, Hangzhou, Zhejiang 310018, China
[3] College of Materials and Chemistry, China Jiliang University, Hangzhou, Zhejiang 310018, China
[*]E-mail: dchen_80@hotmail.com ; lichangsheng@ujs.edu.cn

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In this work, the Ag_3PO_4/TiO_2 nanotube arrays (TNTAs) composite photocatalysts were successfully prepared by a facile chemical impregnation method, and their photocatalytic properties were investigated. It was found that the TNTAs sample, which was prepared by electrochemical anodization, consisted of a highly ordered array of nanotubes with a diameter of about 110 ± 10 nm. For the Ag_3PO_4/TNTAs sample, Ag_3PO_4 nanoparticles (ca. 2~8 nm) were uniformly distributed on the surface of TNTAs. The TNTAs sample mainly absorbed ultraviolet light and rarely visible light. In contrast, the Ag_3PO_4/TNTAs sample absorbed much stronger visible light while maintaining ultraviolet light absorption. More importantly, the visible light photocatalytic activity of Ag_3PO_4/TNTAs for rhodamine B (RhB) degradation was much better than that of TNTAs, and the photodegradation rate constant of Ag_3PO_4/TNTAs was about 2.6 times that of TNTAs. The improved photocatalytic activity of Ag_3PO_4/TNTAs could be attributed to the following two aspects: (1) the loading of Ag_3PO_4 could improve the visible light absorption performance and spectral utilization efficiency of TNTAs; and (2) the heterojunctions formed between Ag_3PO_4 and TNTAs could be beneficial for the separation and transfer of photogenerated charges, which would greatly improve the photocatalytic performance of TNTAs.

Keywords: TiO_2 nanotube arrays (TNTAs); Ag_3PO_4 nanoparticles; Electrochemical anodization; Composite photocatalysts; Photocatalytic activities

FULL TEXT

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