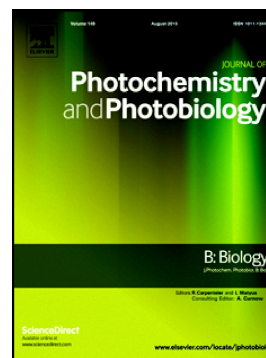


Accepted Manuscript

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PII: S1011-1344(17)30800-X

DOI: doi:[10.1016/j.jphotobiol.2017.11.009](https://doi.org/10.1016/j.jphotobiol.2017.11.009)

Reference: JPB 11051

To appear in: *Journal of Photochemistry & Photobiology, B: Biology*

Received date: 12 June 2017

Revised date: 17 October 2017

Accepted date: 5 November 2017

Please cite this article as: Masoud Faraji, Neda Mohaghegh, Amir Abedini , Ternary composite of TiO₂ nanotubes/Ti plates modified by g-C₃N₄ and SnO₂ with enhanced photocatalytic activity for enhancing antibacterial and photocatalytic activity. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jpb(2017), doi:[10.1016/j.jphotobiol.2017.11.009](https://doi.org/10.1016/j.jphotobiol.2017.11.009)

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Ternary composite of TiO₂ nanotubes/Ti plates modified by g-C₃N₄ and SnO₂ with enhanced photocatalytic activity for enhancing antibacterial and photocatalytic activity

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Abstract

A series of g-C₃N₄-SnO₂/TiO₂ nanotubes/Ti plates were fabricated via simple dipping of TiO₂ nanotubes/Ti in a solution containing SnCl₂ and g-C₃N₄ nanosheets and finally annealing of the plates. Synthesized plates were characterized by various techniques. The SEM analysis revealed that the g-C₃N₄-SnO₂ nanosheets with high physical stability have been successfully deposited onto the surface of TiO₂ nanotubes/Ti plate. Photocatalytic activity was investigated using two probe chemical reactions: oxidative decomposition of acetic acid and oxidation of 2-propanol under irradiation. Antibacterial activities for Escherichia coli (E. coli) bacteria were also investigated in dark and under UV/Vis illuminations. Detailed characterization and results of photocatalytic and antibacterial activity tests revealed that semiconductor coupling significantly affected the photocatalyst properties synthesized and hence their photocatalytic and antibacterial activities. Modification of TiO₂ nanotubes/Ti plates with g-C₃N₄-SnO₂ deposits resulted in enhanced photocatalytic activities in both chemical and microbial systems. The g-C₃N₄-SnO₂/TiO₂ nanotubes/Ti plate exhibited the highest photocatalytic and antibacterial activity, probably due to the heterojunction between g-C₃N₄-SnO₂ and TiO₂ nanotubes/Ti in the ternary composite plate and thus lower electron/hole recombination rate. Based on the obtained results, a photocatalytic and an antibacterial mechanism for the degradation of E. coli bacteria and chemical pollutants over g-C₃N₄-SnO₂/TiO₂ nanotubes/Ti plate were proposed and discussed.

Keywords: Antibacterial and photocatalytic activity; g-C₃N₄-SnO₂; TiO₂ nanotubes/Ti plate; Escherichia coli; Acetic acid; 2-propanol.

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