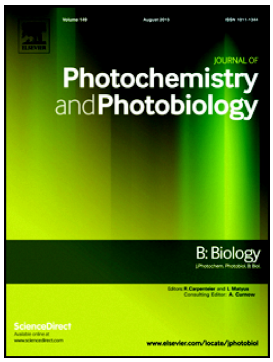

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PII: S1011-1344(17)30800-X
DOI: doi:10.1016/j.jphotobiol.2017.11.009
Reference: JPB 11051

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

Ternary composite of TiO_2 nanotubes/Ti plates modified by g-C_3N_4 and SnO_2 with enhanced photocatalytic activity for enhancing antibacterial and photocatalytic activity

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Abstract

A series of g-C_3N_4-SnO_2/TiO_2 nanotubes/Ti plates were fabricated via simple dipping of TiO_2 nanotubes/Ti in a solution containing $SnCl_2$ and g-C_3N_4 nanosheets and finally annealing of the plates. Synthesized plates were characterized by various techniques. The SEM analysis revealed that the g-C_3N_4-SnO_2 nanosheets with high physical stability have been successfully deposited onto the surface of TiO_2 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 TiO_2 nanotubes/Ti plates with g-C_3N_4-SnO_2 deposits resulted in enhanced photocatalytic activities in both chemical and microbial systems. The g-C_3N_4-SnO_2/TiO_2 nanotubes/Ti plate exhibited the highest photocatalytic and antibacterial activity, probably due to the heterojunction between g-C_3N_4-SnO_2 and TiO_2 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-C_3N_4-SnO_2/TiO_2 nanotubes/Ti plate were proposed and discussed.

Keywords: Antibacterial and photocatalytic activity; g-C_3N_4-SnO_2; TiO_2 nanotubes/Ti plate; Escherichia coli; Acetic acid; 2-propanol.

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