

Accepted Manuscript

Full Length Article

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PII: S0169-4332(18)30314-3
DOI: <https://doi.org/10.1016/j.apsusc.2018.01.290>
Reference: APSUSC 38429

To appear in: *Applied Surface Science*

Received Date: 9 November 2017
Revised Date: 25 January 2018
Accepted Date: 30 January 2018

Please cite this article as: C.A. D'Amato, R. Giovannetti, M. Zannotti, E. Rommozzi, S. Ferraro, C. Seghetti, M. Minicucci, R. Gunnella, A. Di Cicco, Enhancement of Visible-Light Photoactivity By Polypropylene Coated Plasmonic Au/TiO₂ for Dye Degradation In Water Solution, *Applied Surface Science* (2018), doi: <https://doi.org/10.1016/j.apsusc.2018.01.290>

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Enhancement of Visible-Light Photoactivity By Polypropylene Coated Plasmonic Au/TiO₂ for Dye Degradation In Water Solution

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ABSTRACT

A new approach to obtain a heterogeneous photocatalytic material with gold nanoparticles and TiO₂ semiconductor was performed exploiting the reducing ability of acetylacetone, a chemical present in the TiO₂ paste formulation. Gold / TiO₂ heterogeneous catalyst supported on polypropylene [PP@Au-TiO₂]_A was prepared; composition, structure and morphology of this new material were defined by using UV-Vis spectroscopy, Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), X-Ray diffraction (XRD), X-Ray Fluorescence (XRF), Raman Spectroscopy, Photoluminescence and Diffuse Reflectance Spectroscopy. The new material was tested in the photocatalytic degradation of Alizarin Red S in water solution, as target pollutant, under visible light and correlated with structural and spectroscopic characterizations. [PP@Au-TiO₂]_A showed higher photocatalytic activity respect to pure [PP@TiO₂]_A with an improvement of photodegradation kinetic. The best performance was obtained using [PP@Au-TiO₂]_A sample with 0.006 wt.% of Au and the photocatalytic improvement was correlated with the band gap energy decrease of photocatalyst.

Keywords:

TiO₂;

Gold nanoparticles;

Heterogeneous Photocatalysis;

Band gap energy;

Alizarin Red S.

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