

Editorial

TiO₂ Photocatalytic Materials 2014

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Semiconductor photocatalytic material and technology are of great significance in degradation of pollutant and conversion of solar energy. Among various oxide semiconductor photocatalysts, titania is the most important one up to now due to its chemical inertness, low price, nontoxicity, and strong oxidation and reduction ability under solar light. However, the photocatalytic performance of titania should be further improved from the viewpoint of practical application and commerce. To achieve this purpose, we invited investigators to contribute review and original research articles on TiO₂ photocatalytic materials. This special issue consists of 19 papers, mainly related to environmental purification of TiO₂ photocatalytic materials. Among them, 15 papers are about TiO₂ photocatalytic materials. A brief summary of all 19 accepted papers is provided below.

In "Effect of Ce Doping on RGO-TiO₂ Nanocomposite for High Photoelectrocatalytic Behavior," the paper indicates that the Ce-doped RGO-TiO₂ composite film showed higher photoelectrochemical performance than that of RGO-TiO₂ composite and pure TiO₂ under solar simulator irradiation.

The paper "Theoretical Study on Electronic Structure and Optical Performance of Nickel and Nitrogen Codoped Rutile Titanium Dioxide" reports *ab initio* calculations of nickel-doped, nitrogen-doped, and nickel + nitrogen-codoped rutile TiO₂ based on density functional theory.

The paper "Application of Glass Fiber-Based N-Doped Titania under Visible-Light Exposure for Photocatalytic Degradation of Aromatic Pollutants" reports fabrication of flexible glass fiber-supported nitrogen-doped TiO₂ photocatalysts

by a dip-coating method followed by a low-temperature heat-treatment process and their application for the degradation of aromatic volatile organic compounds (VOCs) under visible-light irradiation.

The paper "Effects of UV-Vis Irradiation on Vanadium Etioporphyrins Extracted from Crude Oil and the Role of Nanostructured Titania" reports the use of N-TiO₂/Cu induces an important delay in the initiation of the porphyrins' photodegradation process.

The paper "Influence of Nd-Doping on Photocatalytic Properties of TiO₂ Nanoparticles and Thin Film Coatings" reports structural, optical, and photocatalytic properties of TiO₂ and TiO₂:Nd nanopowders and thin films.

The paper "Effect of Aging Time and Film Thickness on the Photoelectrochemical Properties of TiO₂ Sol-Gel Photoanodes" reports a nonaqueous based sol-gel process to produce TiO₂ based photoelectrodes for solar water splitting.

The paper "Synthesis of Submicron Hexagonal Plate-Type SnS₂ and Band Gap-Tuned Sn_{1-x}Ti_xS₂ Materials and Their Hydrogen Production Abilities on Methanol/Water Photosplitting" reports SnS₂ and Sn_{1-x}Ti_xS₂ ($x = 0, 0.1, 0.3, 0.5, \text{ and } 0.7$ mol) materials designed using solvothermal method with the aim of enhancing hydrogen production from water/methanol aqueous solution.

The paper "Role of Platinum Deposited on TiO₂ in Photocatalytic Methanol Oxidation and Dehydrogenation Reactions" reports that the platinumized titanium dioxide samples are always more active than the corresponding bare TiO₂ for both methanol oxidation and dehydrogenation processes.

The loading with various platinum amounts resulted in a significant improvement of the photocatalytic activity of TiO₂. This beneficial effect was attributed to an increased separation of the photogenerated electron-hole charge carriers.

The paper “An Overview: Recent Development of Titanium Oxide Nanotubes as Photocatalyst for Dye Degradation” presents a critical review of recent achievements in the modification of TiO₂ nanotubes for dye degradation.

The paper “TiO₂ Nanotube Arrays Composite Film as Photoanode for High-Efficiency Dye-Sensitized Solar Cell” presents a double-layered photoanode made of hierarchical TiO₂ nanotube arrays (TNT-arrays) as the overlayer and commercial-grade TiO₂ nanoparticles (P25) as the underlayer for dye-sensitized solar cells (DSSCs).

The paper “Hole-Phonon Relaxation and Photocatalytic Properties of Titanium Dioxide and Zinc Oxide: First-Principles Approach” presents first-principles calculations for the temporal characteristics of hole-phonon relaxation in the valence band of titanium dioxide and zinc oxide.

The paper “Electronic Structures of S/C-Doped TiO₂ Anatase (101) Surface: First-Principles Calculations” presents the electronic structures of sulfur- (S-) or carbon- (C-) doped TiO₂ anatase (101) surfaces investigated by density functional theory (DFT) plane-wave pseudopotential method.

The paper “Synthesis and Photocatalytic Activity of Magnetically Recoverable Core-Shell Nanoparticles” presents TiO₂/SiO₂/Fe₃O₄ (TSF) core-shell nanoparticles with good photocatalytic activity and capable of fast magnetic separation after photocatalytic reaction.

The paper “Photocatalytic Bactericidal Efficiency of Ag Doped TiO₂/Fe₃O₄ on Fish Pathogens under Visible Light” presents photocatalytic bactericidal efficiency of Ag-TiO₂/Fe₃O₄ under visible light using target pollutants that include *Aeromonas hydrophila*, *Edwardsiella tarda*, and *Photobacterium damsela* subsp. *piscicida*.

The paper “Boundary Layer of Photon Absorption Applied to Heterogeneous Photocatalytic Solar Flat Plate Reactor Design” presents the design of heterogeneous photocatalytic solar reactors with flat plate geometry used in treatment of effluents and conversion of biomass to hydrogen.

The paper “Antimicrobial Activity of TiO₂ Nanoparticle-Coated Film for Potential Food Packaging Applications” presents the antimicrobial activity of the films investigated by their capability to inactivate *Escherichia coli* (*E. coli*) in an actual food packaging application test under various conditions, including types of light and the exposed light time.

The paper “Preparation, Characterization, and Biototoxicity of Nanosized Doped ZnO Photocatalyst” presents preparation of five types of nondoped ZnO, iron-doped ZnO, cobalt-doped ZnO, nickel-doped ZnO, and manganese-doped ZnO materials by a wet chemical method, which were then exposed to *Daphnia magna* (*D. magna*) at low and high concentrations (50 and 250 µgL⁻¹).

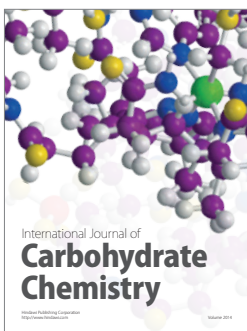
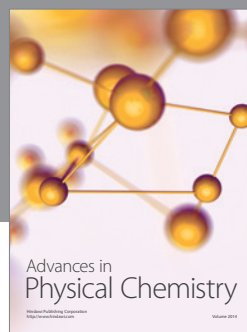
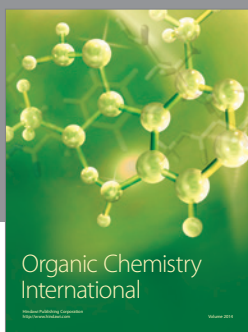
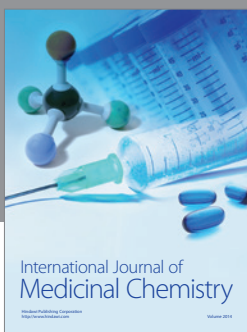
The paper “Manipulation of MWCNT Concentration in MWCNT/TiO₂ Nanocomposite Thin Films for Dye-Sensitized Solar Cell” presents preparation of dye-sensitized solar cell (DSSC) using multiwalled carbon nanotube/titanium dioxide (MWCNT/TiO₂) using sol-gel method.

The paper “Oxidation of 4-Chlorophenol by Mesoporous Titania: Effect of Surface Morphological Characteristics” presents preparation of mesoporous nanocrystalline anatase via EISA employing CTAB as structure directing agent.

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