



# **Nanostructured Titanium Dioxide Materials:Properties, Preparation and Applications**

*Alireza Khataee, G Ali Mansoori*

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During the past decade, research and development in the area of synthesis and applications of different nanostructured titanium dioxide have become tremendous. This book briefly describes properties, production, modification and applications of nanostructured titanium dioxide focusing in particular on photocatalytic activity. The physicochemical properties of nanostructured titanium dioxide are highlighted and the links between properties and applications are emphasized. The preparation of  $TiO_2$  nanomaterials, including nanoparticles, nanorods, nanowires, nanosheets, nanofibers, and nanotubes are primarily categorized by their preparation method (sol-gel and hydrothermal processes). Examples of early applications of nanostructured titanium dioxide in dye-sensitized solar cells, hydrogen production and storage, sensors, rechargeable batteries, electrocatalysis, self-cleaning and antibacterial surfaces and photocatalytic cancer treatment are reviewed. The review of modifications of  $TiO_2$  nanomaterials is mainly focused on the research related to the modifications of the optical properties of  $TiO_2$  nanomaterials, since many applications of  $TiO_2$  nanomaterials are closely related to their optical properties. Photocatalytic removal of various pollutants using pure  $TiO_2$  nanomaterials,  $TiO_2$ -based nanoclays and non-metal doped nanostructured  $TiO_2$  are also discussed.

## **Contents:**

- Introduction
- Properties of Titanium Dioxide and its Nanoparticles
- Preparation of Nanostructured Titanium Dioxide and Titanates
- Applications of Nanostructured Titanium Dioxide
- Supported and Immobilized Titanium Dioxide Nanomaterials

**Readership:** Advanced undergraduates and graduate students in engineering, nanomaterials, chemical and physical sciences; science and engineering experts interested in nanoscience & nanotechnology.

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