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## Electrical and optical properties of platinum doped titanium dioxide nanoparticle: improved performance in dye sensitized solar cells

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JOURNAL OF OPTOELECTRONICS AND ADVANCED MATERIALS

Volume: 17 Issue: 5-6 Pages: 573-578

Published: MAY-JUN 2015

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### Abstract

The undoped and doped TiO<sub>2</sub> particles with different concentrations of Pt (1-6%) were synthesized by a simple hydrothermal method. The resulting material was further characterized by standard analytical techniques such as x-ray diffraction (XRD), scanning electron microscopy (SEM), and UV-vis spectroscopy. The XRD analysis showed no change in crystal structure of TiO<sub>2</sub> after doping with different concentration of Pt, confirming anatase phase of TiO<sub>2</sub>. The electrical analysis showed that the dielectric constant (epsilon') and dielectric loss tangent (tan delta) had decrement trend with increase in frequency. The dielectric property was found to decrease with increase in dopant concentration. At low frequency, the mechanism of a.c. conductivity was found to be same as that of d.c. conduction. With increase in frequency, the magnitude of complex impedance was found to decrease indicating the increase in a.c conductivity. Dopant concentration was also found to increase with corresponding increase in the value of impedance. Under simulated solar illumination, the amount of dye absorption was found to increase with the increase in optimum content of Pt, resulting in the gradual increase in photovoltaic current, this could be contributed to the improvement in the cell efficiency from 6.45 to 7.62%.

### Keywords

**Author Keywords:** Pt-doped TiO<sub>2</sub>; Complex impedance; Dielectric properties; a.c. Conductivity

**KeyWords Plus:** ENHANCED PHOTOCATALYTIC ACTIVITY; VISIBLE-LIGHT; TIO2

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### Publisher

NATL INST OPTOELECTRONICS, 1 ATOMISTILOR ST, PO BOX MG-5, BUCHAREST-MAGURELE 76900, ROMANIA

### Categories / Classification

**Research Areas:** Materials Science; Optics; Physics

**Web of Science Categories:** Materials Science, Multidisciplinary; Optics; Physics, Applied

### Document Information

**Document Type:** Article

**Language:** English

**Accession Number:** WOS:000357766600010

**ISSN:** 1454-4164

**eISSN:** 1841-7132

### Citation Network

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