



Research Article



## Characterization of Cr doped TiO<sub>2</sub> based Diluted Magnetic Semiconductor Nanomaterials

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### DOI:

[http://dx.doi.org/  
10.17812/IJRA.4.15\(96\)2017](http://dx.doi.org/10.17812/IJRA.4.15(96)2017)

### Manuscript:

Received: 8<sup>th</sup> Aug, 2017

Accepted: 17<sup>th</sup> Sep, 2017

Published: 20<sup>th</sup> Sep, 2017

### Publisher:

Global Science Publishing  
Group, USA

<http://www.globalsciencepg.org/>

### ABSTRACT

Nanomaterial are most versatile and used to develop the tools widely in technical and medicinal fields. In this present scenario the synthesis, experimental and

characterization techniques along with theoretical methods of Cr doped TiO<sub>2</sub> have been reported. Thermal, microstructural, morphological, compositional, optical, dielectric and magnetic properties of Cr doped TiO<sub>2</sub> NPs were studied. Ferromagnetism in DMSs along with the important properties and applications of TiO<sub>2</sub> nanomaterial. The DMSs are useful class of functional materials and play a crucial role in enabling the semiconductor spintronic devices. In this paper we discuss about the synthesis and studies of Cr doped TiO<sub>2</sub> (titania) based diluted magnetic semiconductor (DMS) nanoparticles (NPs). The doping concentration is  $\leq 7$  mol %. Purely single phase TiO<sub>2</sub> based DMSs have been synthesized through wet chemical routes (acid modified sol-gel process) and these materials are in nanocrystalline form. The crystalline structure of all the samples is identified with tetragonal anatase phase with space group I41/amd. Cr doping leads to enhancement in the dielectric properties of TiO<sub>2</sub> NPs whereas Co doping diminishes the same. These two dopings make the NPs ferromagnetic with saturation magnetization of the order of 10–3 emu/g for Cr doped while 10–2 emu/g for Co doping. In the case of 5 mol % Co doped TiO<sub>2</sub> NPs, few beautiful spherical-flower like nanostructures with diameter of ~120 nm are observed.

**Keywords:** Nanomaterial, Cr doped TiO<sub>2</sub>, diluted magnetic semiconductor.

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### IJRA - Year of 2017 Transactions:

Month: July - September

Volume – 4, Issue – 15, Page No's: 576-580

Subject Stream: Physics

**Paper Communication:** Author Direct

**Paper Reference Id:** IJRA-2017: 4(15)576-580