



Research Article



Characterization of Cr doped TiO₂ based Diluted Magnetic Semiconductor Nanomaterials

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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 TiO₂ have been reported. Thermal, microstructural, morphological, compositional, optical, dielectric and magnetic properties of Cr doped TiO₂ NPs were studied. Ferromagnetism in DMSs along with the important properties and applications of TiO₂ 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 TiO₂ (titania) based diluted magnetic semiconductor (DMS) nanoparticles (NPs). The doping concentration is ≤ 7 mol %. Purely single phase TiO₂ 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 TiO₂ 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 TiO₂ NPs, few beautiful spherical-flower like nanostructures with diameter of ~120 nm are observed.

Keywords: Nanomaterial, Cr doped TiO₂, diluted magnetic semiconductor.

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