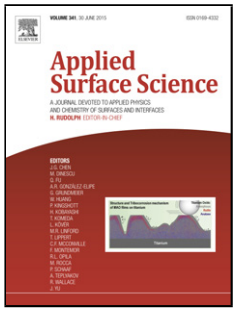

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Enhancement of room temperature ferromagnetism in Tin Oxide nanocrystal using organic solvents

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Highlights of the Manuscript

- The effect of organic solvents (ethanol & ethylene glycol) on the room temperature ferromagnetism in nanocrystalline tin oxide has been studied.
- Pristine SnO_2 nanocrystal contain two different types of paramagnetic centres over their surface: (i) surface chemisorbed oxygen species and (ii) Sn interstitial & oxygen vacancy defect pair.
- The room temperature ferromagnetic property of the sample strongly depend on the amount of defect complexes, such as $(\mathrm{Sn_i} - \mathrm{V_O^+})$ defect pair, present on their surface.
- Ethylene glycol is an efficient solvent to induce magnetic moment in tin oxide nanostructure.

Abstract

The effect of organic solvents (ethanol & ethylene glycol) on the room temperature ferromagnetism in nanocrystalline tin oxide has been studied. The samples were synthesized using sol-gel method with the mixture of water & organic liquid as solvent. It is found that pristine SnO_2 nanocrystal contain two different types of paramagnetic centres over their surface:(i) surface chemisorbed oxygen species and (ii) Sn interstitial & oxygen vacancy defect pair. The magnetic moment induced in the as-prepared samples is mainly contributed by the alignment of local spin moments resulting from these defects. These surface defect states are highly activated by the usage of ethylene glycol solvent rather than ethylene in tin oxide nanostructure synthesis. Powder X-ray diffraction, transmission electron microscope imaging, energy dispersive spectrometry, Fourier transformed infrared spectroscopy, UV-Vis absorption spectroscopy, photoluminescence spectroscopy, vibrating sample magnetometer measurement and electron spin resonance spectroscopy were employed to characterize the nanostructured tin oxide materials.

Keywords: *Tin oxide nanocrystal; room temperature ferromagnetism; organic solvent; EPR study*

1. Introduction:

In recent years, metal oxide nanoparticles are highly attractive candidates in the field of biomedicine [1], optical sensor [2], catalyst [3,4], chemiresistors [5], and electron transparent layer [6]. The unique physiochemical properties of the metal oxides make them one of the crucial material