Improved room temperature ferromagnetism in Ni doped SnO_2 nanoparticles: A detailed study

Tripathi P
Aligarh Muslim University, India

In this talk we emphasized on a detailed investigation of the structural, optical, and magnetic properties of pure and Ni-doped SnO_2 nanoparticles (NPs) synthesized by a sol-gel process. An extensive structural study has been carried out using various characterization techniques. The X-ray Diffraction (XRD) spectra show the formation of the single phase tetragonal structure of pure and Ni-doped SnO_2 NPs without any noticeable impurity phase such as NiO. XRD results revels that the crystallite size of SnO_2 is found to be decreased with Ni doping, which has also been confirmed by the Field Emission Scanning Electron Microscopy study. X-ray Photoelectron Spectroscopy (XPS) measurements displayed a clear sign for Ni^{2+} ions occupying the lattice sites of Sn^{4+} in the SnO_2 host which also gives clear evidence for the formation of single phase Sn1-xNixO_2 NPs. The optical analysis shows a significant decrease in the energy gap of SnO_2, (i.e., from 3.71 eV to 3.28 eV) as Ni concentration increases which may be correlated with the core level valence band XPS analysis. Photoluminescence studies show that Ni doping creates oxygen vacancies due to dissimilar ionic radii of Ni^{2+} and Sn^{4+}. Superconducting quantum interference device measurements revealed that the Ni doped SnO_2 NPs exhibit strong ferromagnetic behavior at room temperature and this analysis has been well fitted with a simple relationship to find out magnetic parameters proposed by Stearns and Cheng et al. Hence, our results demonstrate that Ni-doping has strong impact on the structural, optical, and magnetic properties.

e: pushpendratripathi05@gmail.com

Notes: