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Tanumoy Debnath, Sukhen Das, Dipankar Das, Soumyaditya Sutradhar

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Optical, Magnetic and Dielectric Properties of ZnO:Y Nanoparticles Synthesized by Hydrothermal Method

Tanumoy Debnath[1,2], Sukhen Das[2], Dipankar Das[3], Soumyaditya Sutradhar[1*]

[1]Department of Physics, Amity University, Rajarhat, Kolkata-700156

[2]Department of Physics, Jadavpur University, Jadavpur, Kolkata-700032

[3]UGC-DAE Consortium for Scientific Research, III/LB-8, Kolkata-700098

Abstract:

Y^{3+} ions doped zinc oxide nanoparticles were prepared by hydrothermal method. The desired nanocrystalline phase and intrinsic defects inside the host ZnO nanoparticles was obtained by taking the as prepared samples, doped with different Y^{3+} ion concentrations, at 400 ^{o}C for 6 hrs in vacuum atmosphere. The crystallinity and morphology of all the samples were investigated using X-ray diffraction (XRD) and field emission scanning electron microscopy (FESEM). Atomic vibrational mode of the samples has been investigated by FTIR spectroscopy. The formation of oxygen vacancy and the trapping of electron in Y^{3+} ions doped ZnO nanorods were also confirmed by PL and Raman analysis which are very useful for the determination of different types of defect in the sample. Magnetic measurement shows the presence of room temperature ferromagnetism in the samples which has been successfully explained by the vacancy assisted bound magnetic polaron model. Frequency as well as temperature dependent dielectric constant of the samples was also investigated. High value of dielectric constant in the Y^{3+} ions doped ZnO sample was obtained.

Keywords: Diluted magnetic semiconductor, Nanoparticles, Magnetic properties, Space charge polarization.

*Corresponding author email: sds.phy1@gmail.com (Dr. S. Sutradhar), Fax: 1800 200 3320