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Metamorphosis Remark on Room Temperature Ferromagnetism, with Relevant Spectroscopy Studies on the Sintered ZnO

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V. Pazhanivelu, K. Aravinth, R. Thiyagarajan, A. Paul Blessington Selvadurai, P. Ramasamy & R. Murugaraj

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Abstract

We report on the effect of sintering temperature on pure ZnO nanoparticles (NPs) by different characterization techniques and discuss the reduction of room temperature ferromagnetism (RTFM) on the basis of lattice defects and grain boundary networks. Pure ZnO nanoparticles (NPs) are prepared by co-precipitation method and are sintered at four different temperature points viz., 400, 500, 600, and 700 °C, respectively. X-ray diffraction (XRD), transmission electron microscope (TEM) and scanning electron microscope (SEM) characterizations confirm the phase purity and morphology of all sintered ZnO NPs. However, by increasing of sintering temperature, the grains adjust their shape from a sphere to irregular hexagonal. The UV-absorption spectroscopy technique suggests the reduction of band gap by increasing sintering temperature ascribed to the size confinement effect. The Raman, photoluminescence (PL), and electron paramagnetic resonance (EPR) spectroscopic measurements also suggest the

presence of the lattice defect in prepared pure ZnO NPs by increasing the sintering temperatures. Finally, during the magnetization measurements, the suppression of RTFM also is observed by increasing the sintering temperature. The correlation between the defect density and magnetic behavior is analyzed by the variation of sintering temperature.

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Author information

Authors and Affiliations

SSN Research Centre, Sri Sivasubramaniya Nadar College of Engineering, Tamil Nadu, Kalavakkam, TN, 603110, India
V. Pazhanivelu, K. Aravinth & P. Ramasamy

Department of Physics, Vivekanandha College of Engineering for Women (Autonomous), Elayampalayam Namakkal, Tiruchengode, 637 205, Tamil Nadu, India
V. Pazhanivelu

Department of Science of Humanites, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, Thandalam, Chennai, 602105, India

R. Thiyagarajan

Department of Materials Science, University of Madras, Guindy Campus, Chennai, 600025, India

A. Paul Blessington Selvadurai

Department of Physics, MIT Campus, Anna University, Chennai, 600 044, India

R. Murugaraj

Corresponding author

Correspondence to V. Pazhanivelu.

Additional information

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