Nanotek-2013

OMICS Group Conferences
Accelerating Scientific Discovery

3rd International Conference on
Nanotek & Expo

December 2-4, 2013 Las Vegas, USA

The role of reduced graphene oxide capping on defect induced ferromagnetism of ZnO nanorods

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Abstract

In this study, the effect of different numbers of layers of reduced graphene oxide (RGO) on the ferromagnetic behavior of zinc oxide–reduced graphene oxide (ZnO–RGO) hybrid architectures has been investigated. Scanning and transmission electron microscopy along with x-ray diffraction of these hybrids confirm that ZnOnanorods are wrapped with different numbers of layers of RGO in a controlled way and their hexagonal phase is unaffected by these layers. Raman and photoelectron spectroscopy of these hybrids reveals that RGO does not alter the nonpolar optical phonon E2 (high) mode and chemical state of Zn2C in ZnO. Electron paramagnetic resonance (EPR) spectra show that RGO passivates singly charged oxygen vacancies (VCOS) in ZnO. It correlates the passivation efficiency of VCOS to the number of RGO layers and this has been achieved up to 90% by _31 layers of RGO. Due to passivation of VCOS in ZnO by RGO, the ferromagnetic behavior (saturation magnetization and divergence between zero field cooled and field cooled) in ZnO–RGO hybrids is suppressed as compared to ZnO. Combining the EPR and magnetic behavior, a direct link between the passivation of the singly charged oxygen vacancies present on the surface of ZnOnanorods and the number of RGO layers is established.

Biography

Sushil Misra is a Full Professor of Physics at Concordia University, Montreal, Canada. He has done extensive experimental and theoretical research in electron paramagnetic resonance, with some 270 papers to his credit. Currently, he collaborates with ACERT (Advanced Center for Electron Spin Resonance Technology) at Cornell University. He has written numerous review articles and book chapters on EPR, and has been invited frequently as a specialist to present lectures at international conferences. He was one of the early EPR researchers invited by the People's Republic of China as a foreign expert on EPR in 1985.