

Fabrication of ZnO/ZnS core-shell nanorods by hydrothermal method and study of their structural and optical properties

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Abstract

This study reports the production of ZnO nanorods and ZnO/ZnS core/Shell nanorods. The fabricated nanostructures are characterized and studied using different methods including X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), Field Emission Scanning Microscopy (FESM), UV-Visible (UV) and Photoluminescence (PL) spectroscopy. Results of XRD spectrums clearly show a hexagonal Wurtzite crystal structure for ZnO nanorods and for grown-coated ZnS nanoparticles on ZnO nanorods a cubic Zinc blende crystal structures. The morphology studies of these structures by SEM and FESM have shown the diameters of ZnO nanorods, ZnS nanoparticles, and ZnO/ZnS core/Shell nanorods to be 70, 20 and 120 nanometers, respectively. The absorption spectra of ZnO/ZnS core/Shell compared to ZnO and ZnS structures have clearly shown a shift of absorption band of core/shell structure towards longer wavelengths. This is due to a reduction of efficient band gaps of core/shell structures, as predicted. Results of PL studies have also shown that the coating of zinc oxide nanorods by ZnS nanoparticles decreases some of the structural defects and, consequently, reduces the visible radiation resulting from the structural defect.

Keywords: ZnO Nanorods, ZnO/ZnS Core/Shell Nanorods, Hydrothermal Method, Thermal Decomposition Method, Surface Defects

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