TW-P008

Influence of Growth Temperature for Active Layer and Buffer Layer Thickness on ZnO Nanocrystalline Thin Films Synthesized Via PA-MBE

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Zinc oxide (ZnO) nanocrystalline thin films on various growth temperatures for active layer and different buffer layer thickness were grown by plasma-assisted molecular beam epitaxy (PA-MBE) on Si substrates. The ZnO active layer were grown with various growth temperature from 500 to 800°C and the ZnO buffer layer were grown for different time from 5 to 40 minutes. To investigate the structural and optical properties of the ZnO thin films, scanning electron microscope (SEM), X-ray diffractometer (XRD), and photoluminescence (PL) spectroscopy were used, respectively. In the SEM images, the ZnO thin films have high densification of grains and good roughness and uniformity at 800°C for active layer growth temperature and 20 minutes for buffer layer growth time, respectively. The PL spectra of ZnO buffer layers and active layers display sharp near band edge (NBE) emissions in UV range and broad deep level emissions (DLE) in visible range. The intensity of NBE peaks for the ZnO thin films significantly increase with increase in the active layer growth temperature. In addition, the NBE peak at 20 minutes for buffer layer growth time has the largest emission intensity and the intensity of DLE peaks decrease with increase in the growth time.

Keywords: zinc oxide, plasma-assisted molecular beam epitaxy, growth temperature, photoluminescence

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Influence of Sn Doping on Structural and Optical Properties of Zinc Oxide Nanorods Prepared Via Hydrothermal Process

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Hydrothermally grown ZnO nanorods were synthesized with various Sn contents on quartz substrates, ranging from 0 to 2.5 at% in increment 0.5 at%. Scanning electron microscopy (SEM) and ultraviolet (UV)-visible spectroscopy were used to determine the effect of Sn doping on the structural and optical properties. In the SEM images, the nanorods have hexagonal wurzite structure and the diameter of the nanorods increase with increase in the Sn contents. The optical parameters of the Sn-doped ZnO nanorods such as the absorption coefficients, optical bandgaps, Urbach energies, refractive indices, dispersion parameters, dielectric constants, and optical conductivities were gained from the transmittance and reflectance results. In the PL spectra, the NBE peaks in the UV region decrease and blue-shift with increase in the Sn contents. In addition, the DLE peaks in the visible region of the nanorods shift toward low-energy region when the ZnO nanorods doped with various Sn contents.

Keywords: Zinc Oxide, tin, photoluminescence, optical parameter, hydrothermal growth