

Morphological, optical, and Raman characteristics of ZnO nanoflakes prepared via a sol-gel method

Abstract

Two-dimensional (2D) ZnO nanoflakes were grown on thin aluminum layer, deposited on silicon substrate, using a sol-gel method. The surface morphologies of ZnO nanoflakes at different precursor concentrations were studied using scanning electron microscopy (SEM). Combined studies of SEM, photoluminescence (PL), and Raman spectroscopy suggested that nanorods started to grow along with nanoflakes at a precursor concentration of 0.05 M and the density of the nanorods significantly increased when the concentration was raised to 0.075 M. Both the UV-luminescence and Raman spectra were intensified and redshifted with the increment of precursor concentration. Spectral intensification suggests improvement in crystal qualities and better optical properties of the fabricated ZnO nanostructures. The structural defects at lower levels of precursor were probably due to the hypoxic environment, whereas, the redshift of PL and Raman spectra was due to the local heating of ZnO nanocrystals.