

Physical and Electrical Characterization of ZnO Thin Films Prepared by Sol-Gel Method

Authors : Mohammadreza Tabatabaei, Reza Sedaghati

Abstract : In this paper, Zinc Oxide (ZnO) thin films are deposited on glass substrate by sol-gel method. The ZnO thin films with well defined orientation were Acquired by spin coating of zinc acetate dehydrate monoethanolamine (MEA), de-ionized water and isopropanol alcohol. These films were pre-heated at 275°C for 10 min and then annealed at 350°C, 450°C and 550°C for 80 min. The effect of annealing temperature and different thickness on structure and surface morphology of the thin films were Verified by atomic force microscopy (AFM). It was found that there was a significant effect of annealing temperature on the structural parameters of the films such as roughness exponent, fractal dimension and interface width. Thin films also were characterized by X-ray Diffractometry (XRD) method. XRD analysis revealed that the annealed ZnO thin films consist of single phase ZnO with wurtzite structure and show the c-axis grain orientation. Increasing annealing temperature increased the crystallite size and the c-axis orientation of the film after 450°C. Also In this study, ZnO thin films in different thickness have been prepared by Sol-gel method on the glass substrate at room temperature. The thicknesses of films are 100, 150 and 250nm. Using fractal analysis, morphological characteristics of surface films thickness in amorphous state were investigated. The results show that with increasing thickness, surface roughness (RMS) and lateral correlation length (ξ) are decreased. Also, the roughness exponent (α) and growth exponent (β) were determined to be 0.74 ± 0.02 and 0.11 ± 0.02 , respectively.

Keywords : ZnO; Thin film; Fractal analysis; Morphology; AFM; annealing temperature; different thickness; XRD.

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