

EFFECT OF SOL CONCENTRATION ON OPTICAL PROPERTIES OF SOL-GEL THIN FILMS FOR PHOTONIC APPLICATIONS

M. Tazerout, A. Chelouche, S. Khodja, D. Djouadi, A. Aksas¹, T. Touam

Abstract : In this work, effect of zinc acetate concentration on ZnO thin films dip-coated on glass substrates has been investigated. As a starting material, zinc acetate dehydrate was dissolved in a mixture of ethanol and monoethanolamine solution with a sol concentration of 0.5, 0.6, 0.7, and 0.8 mol. L⁻¹. The samples were characterized by X-Ray Diffraction (XRD) and the results clearly demonstrate that all the obtained films display a ZnO hexagonal wurtzite structure with a strong preferential orientation of the (002) direction. The thickness of the all samples was measured to be about of 350 nm by a Profilometer. The Roughness Mean Square (RMS) extracted from the Atomic Force Microscopy (AFM) images of the ZnO thin films surfaces show a small roughness value. It was estimated about of 6 nm for the thin film synthesised with a sol concentration of 0.7M. The optical transmission spectra in the UV-Visible domains indicate transmission values greater than 70% for all of the deposited layers. They also show that increasing the concentration, the maximum transmission exceeds 90% for all layers and moves towards longer wavelengths. For concentrations of 0.5 and 0.6 M, the best transmission is in the visible region, while for concentration of 0.7 to 0.8 M, it is maximal in the IR one. We also find that the optical gap is dependent on the concentration. It has a maximum value for a concentration of 0.7M.

Keywords : sol-gel, ZnO thin films, optical properties, Photonic applications