

Evaluation of the optical characteristics of *c*-axis oriented zinc oxide thin films grown by sol gel spin coating technique

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Abstract. In this work we have systematically studied the optical characteristics of synthesized wurzite zinc oxide thin films exhibiting (002) orientation. Using sol gel spin coating technique zinc oxide thin films are grown on pre cleaned fused quartz substrates. Structural properties of the films are studied using X-ray diffraction analysis. Micro structural analysis and thickness of the grown samples are analyzed using field emission scanning electron microscopy. With an aim to investigate the optical characteristics of the grown zinc oxide thin films the transmission and reflection spectra are evaluated in the ultraviolet-visible (UV-VIS) range. Using envelope method, the refractive index, extinction coefficient, absorption coefficient, band gap energy and the thickness of the synthesized films are estimated from the recorded UV-VIS spectra. An attempt has also been made to study the influence of crystallographic orientation on the optical characteristics of the grown films.

Keywords: Crystal texture; Grain growth; Optical property; Envelope method

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1. Introduction

The optical characteristics of metal oxide films are greatly influenced by their crystallographic orientation. The influence of preferential orientation on the optical characteristics of the thin films has scarcely been reported in the literature. As explained by F. Paraguay-Delgado, et al. texture has strong influence on the optical properties of the tin oxide thin films [1]. Various techniques have been used to grow such oriented thin films. This includes CVD (chemical vapor deposition), radio frequency sputtering, ion-beam evaporation, MBE (molecular beam epitaxy), spray pyrolysis, and so on [2-3]. Usually these techniques are expensive and also need special approach for the growth. In these methods careful regulation of various parameters during growth facilitates the growth of films with desired orientations. However, in the literature there are hardly any reports on the synthesis of thin films by simple and cost effective sol gel spin coating technique [4]. In this method the growth along specific directions depends on several factors, such as the concentration and viscosity of the sol, speed of the spin coater unit, drying and annealing schedule, etc. Hence using this method, precise control of all these parameters and acquiring a metal oxide thin film with desired orientation is really a

