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MORPHOLOGICAL AND STRUCTURAL PROPERTIES OF SOL-GEL DERIVED ZnO THIN FILMS SPIN-COATED ON DIFFERENT SUBSTRATES

Nabihah Kasim^{1,*}, Zainuriah Hassan¹, Way Foong Lim¹, Sabah M. Mohammad¹, Hock Jin Quah¹

¹*Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia, 11800 USM, Penang, MALAYSIA.*

(E-mail: nabihah.kasim@gmail.com, zai@usm.my, way_foong@usm.my, sabah@usm.my, hock_jin@usm.my)

ABSTRACT- In this work, ZnO thin films were prepared by the low-cost sol-gel method onto six different substrates (glass, ITO coated glass, sapphire (Al₂O₃), p-Si, p-GaN and polyethylene terephthalate (PET)) to study the effects of these substrates on the morphological and structural properties of the produced films. Zinc acetate dihydrate dissolved in ethanol was used as a precursor while monoethanolamine (C₂H₇NO) was added to serve as a base and complexing agent. The corresponding ZnO thin films were characterized using Field Emission Scanning Electron Microscopy (FESEM), high resolution X-ray diffraction (XRD) and atomic force microscopy (AFM). Results revealed distinct morphological and structural properties of ZnO thin films deposited on each substrate. The most uniform morphology was identified on glass, owing to the acquisition of the averagely stable grain sizes (58 nm – 61 nm) and thin film thicknesses (280 nm – 325 nm). High resolution XRD analysis showed that the films deposited on glass, ITO, p-Si, and p-GaN were attributed to hexagonal crystallite structures while the films deposited on sapphire and PET substrates exhibited amorphous phases. Amongst the samples, the ZnO thin film deposited on p-Si demonstrated preferred orientation in (002) direction.

Keywords: zinc oxide, sol-gel, spin-coating, substrates, morphology, structural.