The effect of Annealing Temperature on Structural & Optical Properties of Nanocrystalline SnO₂ Thin Films Prepared by Sol-Gel Technique

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ABSTRACT:

In this work, studying the structural and optical Nano crystalline SnO₂ thin films grown on cleaned glass substrates by using sol-gel (dip coating) technique. It is worthy to say that the thickness of the deposited film was of the order of (300-400)nm. The films are annealed in air at 300°C, 400°C and 500°C temperatures for 60 minutes. The films that are analyses by X-ray diffraction (XRD), Scanning electron microscopy (SEM), atomic force microscopy and optical absorption spectroscopy technique. The size of crystalline was observed, as well as, so as to increase with increasing annealing temperature. XRD analysis reveals that the whole films are polycrystalline with tetragonal structure with preferred orientation of (110),(101),(200) and (211). The increase of annealing temperature lead to raise the diffraction peaks and decrease of FWHM. The atomic force microscopy (AFM) and Scanning electron microscopy (SEM) results showed that the average grain size was increase with the increase in annealing temperature. Spectra of transmittance and absorbance was recorded at wavelengths range (300-1000)nm. The optical properties showed high transmission at visible regions. The optical band gap energy was found to be (3.5 , 3.75 , 3.87) eV at annealing temperature (300,400,500)°C respectively.

Keywords: SnO₂ thin film, annealing temperature, sol-gel.