

Thin Films of Copper Oxide Deposited by Sol-Gel Spin Coating Method: Effect of Annealing Temperature on Structural and Optical Properties

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Abstract : In this study, CuO thin films synthesized via simple sol-gel method, have been deposited on glass substrates by the spin coating technique and annealed at various temperatures. Samples were characterized by X-ray diffraction (XRD), scanning electron microscope (SEM), Fourier-transform infrared (FT-IR) and Raman spectroscopy, and UV-visible spectroscopy. The structural characterization by XRD reveals that the as prepared films were tenorite phase and have a high level of purity and crystallinity. The crystallite size of the CuO films was affected by the annealing temperature and was estimated in the range 20-31.5 nm. SEM images show a homogeneous distribution of spherical nanoparticles over the surface of the annealed films at 350 and 450 °C. Vibrational Spectroscopy revealed vibration modes specific to CuO with monolithic structure on the Raman spectra at 289 cm⁻¹ and on FT-IR spectra around 430-580 cm⁻¹. Electronic investigation performed by UV-Visible spectroscopy showed that the films have high absorbance in the visible region and their optical band gap increases from 2.40 to 2.66 eV (blue shift) with increasing annealing temperature from 350 to 550 °C.

Keywords : Sol-gel, Spin coating method, Copper oxide, Thin films

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