

Microstructural and Optical Characterization of High-quality ZnO Nano-rods Deposited by Simple Electrodeposition Process

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Abstract : Nanostructured Zinc Oxide (ZnO) thin films have been successfully deposited on indium tin oxide (ITO) coated glass substrates by a simple two electrode electrodeposition process at constant potential. The preparative parameters such as deposition time, deposition potential, concentration of solution, bath temperature and pH value of electrolyte have been optimized for deposition of uniform ZnO thin films. X-ray diffraction studies reveal that the prepared ZnO thin films have a high preferential oriented c-axis orientation with compact hexagonal (wurtzite) structure. Surface morphological studies show that the ZnO films are smooth, continuous, uniform without cracks or holes and compact with nanorod-like structure on the top of the surface. Optical properties reveal that films exhibit higher absorbance in the violet region of the optical spectrum; it gradually decreased in the visible range with increases in wavelength and became least at the beginning of NIR region. The photoluminescence spectra shows that the observed peaks are attributed to the various structural defects in the nanostructured ZnO crystal. The microstructural and optical properties suggest that the electrodeposited ZnO thin films are suitable for application in photosensitive devices such as photovoltaic solar cells photoelectrochemical cells and light emitting diodes etc.

Keywords : electrodeposition, microstructure, optical properties, ZnO thin films

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