

Structural, electronic and optical properties of ZnO thin film grown on Si and Glass substrates

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Zinc oxide (ZnO) has attracted increasing interest because its superior electronic and optical properties lead to a wide range of applications such as organic and amorphous semiconductors for plastic electronics, light-emitting diodes, photo detectors, transparent electrodes in solar cells, and transparent thin film transistors (TFT).

The electronic and optical properties of ZnO thin films are essential to understand the transport properties of TFTs devices based on ZnO.

In this work, we deposited the ZnO thin films on Si and Glass substrates by using the rf sputtering method with changing the ratio of Argon gas to Oxygen gas flow rate. The structural, electronic and optical properties of ZnO thin films deposited on Si and Glass substrates have been investigated by using x-ray diffraction (XRD), extended x-ray absorption fine structure (EXAFS), reflection electron energy loss spectroscopy (REELS) and X-ray photoelectron spectroscopy (XPS). Optical properties of ZnO thin films are determined by quantitative analysis of the REELS spectrum using Tougaard-Yubero QUEELS- $\varepsilon(k,\omega)$ -REELS software package.

The XRD spectra indicated polycrystalline and single crystalline nature of ZnO deposited on Si and Glass, respectively. EXAFS spectra show that the amplitude of Zn-O and Zn-Zn bonding on ZnO thin films deposited with oxygen gas are lower than that without oxygen gas. The band gap (3.10.1 eV) and optical properties are the same for all ZnO thin films.

Keywords: REELS; optical properties, EXAFS; XRD, and XPS