Effects of Thickness on the Electrical, Structural and Optical Properties of ZnO:Al Thin Films Grown by RF Magnetron Sputtering Deposition.

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Transparent films with low resistivity have been intensively investigated for display device applications, such as at panel displays, solar cells and touch panels. In this study, polycrystalline transparent conductive aluminium doped zinc oxide (ZnO:Al) films, have been grown successfully on glass and silicon substrates by rf magnetron sputtering technique at room temperature. The thickness effect on the structural, optical and electrical properties of these samples is then studied. The structural characterization was carried out by X-ray diffraction (XRD) and scanning electron microscopy (SEM). The dc electrical resistivity measurement is achieved in dark at room temperature with four-point probes technique. UV-visible spectroscopy was carried out for the optical characterization. The results show that all the deposited films present a crystalline wurtzite structure with a strong preferred (002) orientation. The intrinsic compressive stress was found to decrease with the increase of the film thickness. The electrical resistivity decreases with the increase of the film thickness and the smallest measured value was 8x10⁻⁴ Ωcm for the 1500 nm thick film. The obtained ZnO:Al films, not only have an average transmittance greater than 90 % in the visible region, but also have an optical band gap between 3.32 and 3.49 eV depending on the film thickness.

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