

Effect of Substrate Temperature on the Physical Properties of ZTO Films Deposited by Co-sputtering of ZnO and SnO₂

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Zinc-tin-oxide (ZTO) is a low-cost, non-toxic, and earth-abundant transparent conducting oxide that can be used in several applications. In this study, ZTO films were deposited on soda-lime glass at substrate temperatures, ranging from room temperature to 400 °C, by co-sputtering ZnO and SnO₂ ceramic targets using 100 W of RF and DC power, respectively. The background pressure was achieved around 1.6×10^{-6} Torr and working pressure of 8×10^{-3} Torr set with Ar gas flow of 30 sccm . Physical properties such as optical properties, crystal structure, and morphology of the deposited films were studied. From XRD results, it is found that the deposited ZTO films had amorphous nature at room and 100 °C substrate temperature. Further, ZTO films showed polycrystalline nature in the substrate temperature range of 200 °C - 400 °C, which had a preferred orientation of (311) peak at 2θ of 34.2° . XPS analysis confirmed the presences of Zn, Sn, and O in the deposited sample. The deposited ZTO films had the thickness around 360 nm. From SEM, an increase in compactness and a decrease in grain size were observed upon increasing substrate temperature.