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Deposition of Indium Tin Oxide Films on Polycarbonate Substrates by Ion-Assisted Deposition (IAD)

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Highly transparent and conducting tin-doped indium oxide (ITO) films were deposited on polycarbonate substrate by ion-assisted deposition. Low substrate temperature ($<100^{\circ}\text{C}$) was maintained during deposition to prevent the polycarbonate substrate from being deformed. The influence of ion beam energy, ion current density, and tin doping, on the structural, electrical and optical properties of deposited films was investigated. Indium oxide and tin-doped indium oxide (9 wt% SnO_2) sources were evaporated with assisting ionized oxygen in high vacuum chamber at a pressure of 2×10^{-5} torr and deposition temperature was varied from room temperature to 100°C . Oxygen gas was ionized and accelerated by cold hollow-cathode type ion gun at oxygen flow rate of 1 sccm ($\text{ml}/\text{min.}$). Ion beam potential and ion current of oxygen ions was changed from 0 to 700 V and from 0.54 to $1.62 \mu\text{A}$. The change of microstructure of deposited films was examined by XRD and SEM. The electrical resistivity and optical transmittance were measured by four-point probe and conventional spectrophotometer. From the results of spectrophotometer, both the refractive index and the extinction coefficient were derived.