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Multifunctional Indium Tin Oxide Thin Films

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We have introduced multifunctional ITO single thin films formed by normal sputtering system equipped with a plasma limiter which effectively blocks the bombardment of energetic negative oxygen ions. MFSS ITO also possesses high gas diffusion barrier properties simultaneously low resistivity even it deposited at room temperature without post annealing on plastic substrate. Nano-crystalline enhancement by Ar energy has energy window from 20 to 30 eV under blocking NOI condition. Effect of blocking NOI and optimal Ar energy window enhancement facilitate that resistivity is minimized to $3.61 \times 10^{-4} \Omega\text{cm}$ and the WVTR of 100 nm thick MFSS ITO is $3.9 \times 10^{-3} \text{ g}/(\text{m}^2\text{day})$ which is measured under environmental conditions of 90% relative humidity and 50oC that corresponds to a value of $\sim 10^{-5} \text{ g}/(\text{m}^2\text{day})$ at room temperature. The multifunctional MFSS ITO with low resistivity, and low gas permeability will be highly valuable for plastic electronics applications.

Keywords: ITO, Gas Barrier, sputter,

