Barrier층을 갖는 Soda lime glass 기판위에 증착된 ITO박막의 Annealing 조건에 따른 영향

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Effects of Annealing Condition on Properties of ITO Thin Films Deposited on Soda Lime Glass having Barrier Layers.

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Abstract : Most of the properties of ITO films depend on their substrate nature, deposition techniques and ITO film composition. For the display panel application, it is normally deposited on the glass substrate which has high strain point (>575 degree) and must be deposited at a temperature higher than 250℃ and then annealed at a temperature higher than 300℃ in order to high optical transmittance in the visible region, low reactivity and chemical duration. But the high strain point glass (HSPG) used as FPDs is blocking popularization of large sizes FPDs because it is more expensive than a soda lime glass (SLG). If the SLG could be used as substrate for FPDs, then diffusion of Na ion from the substrate occurs into the ITO films during annealing or heat treatment on manufacturing process and it affects the properties. Therefore proper care should be followed to minimize Na ion diffusion.

In this study, we investigate the electrical, optical and structural properties of ITO films deposited on the SLG and the Asahi glass(PD200) substrate by rf magnetron sputtering using a ceramic target (In_2O_3:SnO_2, 90:10wt.%). These films were annealed in N_2 and air atmosphere at 400℃ for 20min, 1hr, and 2hrs.

ITO films deposited on the SLG show a high electrical resistivity and structural defect as compared with those deposited on the PD200 due to the Na ion from the SLG on diffuse to the ITO film by annealing. However these properties can be improved by introducing a barrier layer of SiO_2 or Al_2O_3 between ITO film and the SLG substrate. The characteristics of films were examined by the 4-point probe, FE-SEM, UV-VIS spectrometer, and X-ray diffraction. SIMS analysis confirmed that barrier layer inhibited Na ion diffusion from the SLG.

Key Words : Soda lime glass, Indium tin oxide, Barrier layer, RF-magnetron sputtering, Ion diffusion