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스퍼터링 방법에 의하여 p-형 Si 기판위에 형성된 높은 투명성과 전도성을 가진 Al-도핑된 ZnO 박막

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최근 투명전극으로 Al-도핑된 ZnO (AZO)가 높은 투명성과 전도성을 가지기 때문에 많은 연구가 진행되고 있다. AZO 박막의 높은 전도성과 광학적 투과성 때문에 유기발광소자 같은 광전소자의 전극으로 많이 응용 되고 있다. 본 연구에서는 스퍼터링 방법으로 실리콘 기판위에 증착된 AZO 박막의 전기적특성과 광학적 특성을 조사하였다. AZO 박막 증착 조건은 ZnO-1 wt.% Al_2O_3 세라믹 타겟을 사용하였고 200°C의 기판 온도에서 100 W 전력으로 5 mTorr의 진공 분위기에서 증착되었다. 후열처리로 온도와 압력을 변화하면서 AZO 박막의 전기적 특성과 광학적 특성 변화를 조사하였다. 실험 결과는 AZO 박막은 높은 전도성과 광학적 투과성을 가짐을 알 수 있었다.

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Characteristics of sputtered ZnO thin films for active layer of TFT

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TFTs (thin film transistors) are switching devices composing of active matrix of FPD (Flat panel displays). For now a-Si:H (hydrogenated amorphous silicon) is widely used in channel layer of TFT. But the low mobility, aperture ratio and stability are the problems [1, 2]. Recently, many researchers are interested in new channel materials. Especially, oxide materials are using on the TFT channel layers. ZnO (Zinc oxide) thin film has high optical band gap (~ 3.3 eV) and c-axis (002) crystallinity in low temperature possible. Also ZnO has high thermal, chemical stability and electrical resistivity tailored (10^{10}~10^{-4} Ω·cm). ZnO thin film was synthesized by radio frequency (RF) magnetron sputtering using pure ZnO target. Among the many sputtering conditions, we varied the RF power to control the structural, optical, and electrical properties such as transmittance and resistivity. We used two substrates such as the glass for the characteristics of ZnO films. We used UV visible, 4-point probe, and hall measurement to investigate the optical transmittance, resistivity, and carrier mobility. Film crystallinity was measure by using XRD (x-ray diffraction). The surface roughness of films was measured by AFM (atomic force microscopy). Film deposition at 50 W shows the adequate property such as high mobility (22.72 cm2/Vs), high transmittance in visible range (over 80%) and small roughness (0.59 nm).