F-7

Effect of Au-ionic Doping Treatment on SWNT Flexible Transparent Conducting Films

민형섭, 정명선, 최원국, 김상식*, 이전국†

한국과학기술연구원; *고려대학교 전기전자공학과

(jkleemc@kist.re.kr†)

Interest in flexible transparent conducting films (TCFs) has been growing recently mainly due to the demand for electrodes incorporated in flexible or wearable displays in the future.

Indium tin oxide (ITO) thin films, which have been traditionally used as the TCFs, have a serious obstacle in TCFs applications. SWNTs are the most appropriate materials for conductive films for displays due to their excellent high mechanical strength and electrical conductivity. In this work, the fabrication by the spraying process of transparent SWNT films and reduction of its sheet resistance on PET substrates is researched

Arc-discharge SWNTs were dispersed in deionized water by adding sodium dodecyl sulfate (SDS) as surfactant and sonicated, followed by the centrifugation. The dispersed SWNT was spray-coated on PET substrate and dried on a hotplate. When the spray process was terminated, the TCF was immersed into deionized water to remove the surfactant and then it was dried on hotplate. The TCF film was then was doped with Au-ionic doping treatment, rinsed with deionized water and dried. The surface morphology of TCF was characterized by field emission scanning electron microscopy. The sheet resistance and optical transmission properties of the TCF were measured with a four-point probe method and a UV-visible spectrometry, respectively. This was confirmed and discussed on the XPS and UPS studies.

We show that 87 Ω/□ sheet resistances with 81% transmittance at the wavelength of 550nm. The changes in electrical and optical conductivity of SWNT film before and after Au-ionic doping treatments were discussed. The effect of Au-ion treatment on the electronic structure change of SWNT films was investigated by Raman and XPS.

Keywords: Transparent Conducting Films (TCF), Single-well Carbon Nanotubes (SWNT), Spray coating, Au-ionic treatment

F-8

Ga-doped ZnO (GZO) 박막의 anti-reflective 특성

박지현, 이민정, 이태일, 명재민†

연세대학교 신소재공학과

(jmmyoung@yonsei.ac.kr†)

정보 기술 시대에 맞춰 광전소자의 연구가 활발해지면서 투명전극으로 사용될 수 있는 Transparent Conductive Oxide (TCO) 재료에 대한 관심이 높아지고 있다. 하지만 TCO의 대표적인 물질인 Indium Tin Oxide (ITO)의 경우 In의 가격 상승으로 인해 최근에는 낮은 전도도와 높은 투과도를 가질 수 있는 대체 물질에 대한 연구가 활발히 진행되고 있다. 그 중에서 3.2 eV 의 높은 밴드갭을 갖는 ZnO 는 가시광선 영역에서 높은 투과율을 나타낼 뿐만 아니라 Al, Ga 을 도핑함으로써 낮은 전도도를 가질 수 있다. 이러한 TCO 재료는 surface texturing을 통하여 optical region 에서 반사를 억제 시킴으로서 빛을 모으는 역할을 하여 태양전지의 효율을 향상 시킬 수 있기 때문에 PV (Photovoltaics) Cell의 anti-reflective coating에 적용 할 수 있다.

본 연구에서는 pulsed DC magnetron sputtering을 이용하여 Ga-doped ZnO (GZO) 박막을 증착하였고, HCl 0.5 wt %로 wet etching을 통하여 surface texturing을 진행하였다. 결정성은 X-ray diffractometer (XRD)로 분석하였으며, 표면 형상은 Scanning Electron Microscope (SEM)을 통해 확인하였다. Van der Pauw 방법을 통해 resistivity, carrier concentration, hall mobility 등의 전기적 특성을 분석하였고 UV-Vis spectrophotometer 를 통해 투과도 및 반사도를 측정하였다.

Keywords: transparent conductive oxide (TCO), Ga-doped ZnO (GZO), wet etching, anti-reflective coating