진공증발원 시스템을 이용한 CIGS 박막의 특성평가에 관한 연구

*,**김 은도, 정 예슬, 정 다운, 엄 기석, 황 도원, 조 성진

Properties of CIGS thin film developed with evaporation system

*,**Eundo Kim, Ye-Sul Jeong, Da Woon Jung, Gi Seog Eom, Do Weon Hwang, Seong Jin Cho

Cu(In,Ga)Se_2 (CIGS) thin film solar cell is currently 19.5% higher efficiency and developing a large area technology. The structure of CIGS solar cell that make five unit layers as back contact, light absorption, buffer, front transparent conducting electrode and antireflection to make them sequentially forming. Materials and various compositions of thin film unit which also manufacture a variety method used by the physical and chemical method for CIGS solar cell. The construction and performance test of evaporator for CIGS thin film solar cell has been done. The vapor pressures were changed by using vapor flux meter. The vapor pressure were copper (Cu) $2.1\times10^{-7}\sim3.0\times10^{-7}$ Torr, indium (In) $8.0\times10^{-7}\sim9.0\times10^{-7}$ Torr, gallium (Ga) $1.4\times10^{-7}\sim2.8\times10^{-7}$ Torr, and selenium (Se) $2.1\times10^{-6}\sim3.2\times10^{-6}$ Torr, respectively. The characteristics of the CIGS thin film was investigated by using X-ray diffraction (XRD), scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS) and photoluminescence (PL) spectroscopy using a He-Ne laser. In PL spectrum, temperature dependencies of PL spectra were measured at 1137 nm wavelength.

Key words : CIGS(구리, 인듐, 갈륨, 셀레늄), Vapor pressure(증기압), Co-evaporation(동시증발법), XRD(X선 회절), Photoluminescence(광발광)

E-mail : *,** edkim@alpha-plus.co.kr

금속 프리커서의 셀렌화에 의한 $Cu_2ZnSnSe_4$ 박막의 특성

*아말 무하마드, 힐미 무함마드, 장 윤정, 김 규호

Characterization of $Cu_2ZnSnSe_4$ thin film produced by selenization of metallic precursor

*M. Ikhlasul Amal, M. Hilmy Alfaruqy, Yun-jung Jang, Kyoo Ho Kim

$Cu_2ZnSnSe_4$ (CZTSe) is one of candidate to alternate Cu(In,Ga)Se_2 as solar absorber material for solar cell. The expensive elements of In and Ga are replaced by Zn and Sn, respectively to lower the material cost. In this study we fabricated CZTSe thin film by selenization of single precursor layer consisted metallic constituent. Precursor compositions ratio were selected to have Cu-poor and Zn-rich content and prepared by RF magnetron sputtering. Thermal processing was applied to introduce selenium into as-deposited films at temperatures ranging from 350 to 500 for time up to 120 minutes. Single precursor films showed amorphous structure and consist of individual elements of Cu, Zn, and Sn. It was confirmed by XRD analysis that synthesis of CZTSe compound is occurred from lower temperature process, although concurrently additional phases such as binary cooper selenides are also existed. The quality of CZTSe crystal was improved as temperature increased. We also investigated the optical and electrical properties of as-selenized CZTSe as well.

Key words : Thin film, solar absorber, $Cu_2ZnSnSe_4$, sputtering, selenization

E-mail : * khokim@yu.ac.kr (K.H.Kim)