Symp D6

Stability and Degradation Mechanism of CdTe Solar Cells with Cu_2Te Contact

Cu_2Te 전극을 이용한 CdTe 태양전지의 안정성과 열화기구 연구

윤재호 · 안병태

한국과학기술원 신소재공학과

The CdTe solar cell is a leading candidate of low-cost thin film solar cells with the cell efficiency of 16.5%. Major problems in CdTe cells are the high contact resistance and the fast efficiency degradation, which can be originated either from the poor CdS/CdTe interface or from the poor CdTe/metal contact under high temperature and/or under illumination.

A 180-nm thick CdS film was grown on an ITO-coated Corning glass substrate in a thiourea solution at 75°C. A 6-㎛ thick CdTe film was deposited on the CdS film by close spaced sublimation with screen-printed CdTe layer as a CdTe source. Then, a 60-nm thick Cu_2Te layer was deposited on the CdTe film at room temperature by evaporating Cu_2Te powder. The samples were annealed at various temperatures for 10 min in N_2.

The efficiency of the CdTe cell was degraded under light illumination or under thermal stress at 60℃ in N_2. The degraded cell was partially recovered by applying reverse bias. To analyze the origin of the degradation, photoluminescence spectra and quantum efficiency spectra were measured. The degradation of CdTe cell was caused by the Cu diffusion from back contact to CdS/CdTe junction. The Cd vacancy sites in CdTe layer which are due to the Cd-deficient composition in our study are easily occupied by Cu diffusion, resulting enhanced Cu diffusion. Moreover the diffused Cu atoms through CdTe layer were segregated in the CdS layer and the defect energy level of Cu in CdS was 1.55 eV above which the light transmittance is strongly reduced, reducing the cell efficiency. And degraded efficiency was recovered by reverse bias because the Cu in CdS or CdS/CdTe interface moved to CdTe layer by internal field from the reverse bias.