

Cu(In,Ga)Se₂ 박막의 Cu 결함 및 In, Ga 비율의 변화에 따른 구조적, 광학적, 전기적 특성 연구

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Structural, optical, and electrical properties on Cu(In,Ga)Se₂ thin-films with Cu-defects and In/(In+Ga) ratio

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We report on a direct measurement of two-dimensional chemical and electrical distribution on the surface of photovoltaic Cu(In,Ga)Se₂ thin-films using a nano-scale spectroscopic and electrical characterization, respectively. The Raman measurement reveals non-uniformed surface phonon vibration which comes from different compositional distribution and defects in the nature of polycrystalline thin-films. On the other hand, potential analysis by scanning Kelvin probe force microscopy shows a higher surface potential or a small work function on grain boundaries of the thin-films than on the grain surfaces. This demonstrates the grain boundary is positively charged and local built-in potential exist on grain boundary, which improve electron-hole separation on grain boundary. Local electrical transport measurements with scanning probe microscopy on the thin-films indicates that as external bias is increases, local current is started to flow from grain boundary and saturated over 0.3 V external bias. This accounts for carrier behavior in the vicinity of grain boundary with regard to defect states. We suggest that electron-hole separation at the grain boundary as well as chemical and electrical distribution of polycrystalline Cu(In,Ga)Se₂ thin-films.

Key words : Cu(In,Ga)Se₂ thin-film solar cells(Cu(In,Ga)Se₂ 박막형 태양전지), Raman spectra(라만 분광), Surface potential(표면 전위), 국소 전기 특성(local electrical properties)

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투명접합을 이용한 이중 태양전지

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Transparent conductive oxide layers-embedding heterojunction Si solar cells

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High-efficient transparent conductive oxide (TCO) film-embedding Si heterojunction solar cells were fabricated. An improved crystalline indium-tin-oxide (ITO) film was grown on an Al-doped ZnO (AZO) template upon hetero-epitaxial growth. This double TCO-layered Si solar cell provided significantly enhanced efficiency of 9.23 % as compared to the single TCO/Si devices. The effective arrangement of TCO films (ITO/AZO) provides a good interface, resulting in the enhanced photovoltaic performances. It discusses TCO film arrangement scheme for efficient TCO-layered heterojunction solar cells.

Key words : Double TCO layers(이중투명전극), Al-doped ZnO template(AZO 기저), Indium tin oxide(ITO), Heterojunction(이중접합), Solar cells(태양전지)

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