50㎛ 기판을 이용한 a-Si:H/c-Si 이종접합 태양전지 제조 및 특성분석

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이종접합태양전지는 단결정 실리콘 기판 표면에 고품질 비정질 실리콘층을 적층함으로써 전기의 근원인 전하의 재결합 손실을 줄여 높은 개방전압을 얻을 수 있다는 특징이 있다. 초박형 태양전지는 기존 태양전지보다 뛰어난 광전변환 특성(Photovoltaic characteristic)을 가지고 두께가 얇아 제품 형상 시 자유도가 높아진다.

본 논문에서는 n-type Bare wafer(160~180μm)를 이용하여 50μm의 웨이퍼를 제작하였다.

a-Si:H(p)_a-Si:H(i)_c-Si(n)의 광흡수층 구조를 성막하여 cell을 제작하였다. 그 결과 Voc(Open Circuit Voltage)가 0.666, Jsc(Short-Circuit Current)가 34.77, FF(Fill Factor) 69.413, Efficency 16.07%를 달성했다.

Key words : Solar cell, Hetero Junction, HIT cell, Thinnest solar panel

TCO/Si 접합 EWT 태양전지에 관한 전기적 및 광학적 특성

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Electrical and Optical Properties for TCO/Si Junction of EWT Solar Cells

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In this work we have investigated electrical and optical properties of interface for ITO/Si with shallow doped emitter. The ITO is prepared by DC magnetron sputter on p-type monocrystalline silicon substrate. As an experimental result, The transmittance at 640㎚ spectra is obtained an average transmittance over 85% in the visible range of the optical spectrum. The energy bandgap of ITO at oxygen flow from 0% to 4% obtained between 3.57eV and 3.68eV (ITO : 3.75eV). The energy bandgap of ITO is depending on the thickness, sturcture and doping concentration. Because the bandgap and position of absorption edge for degenerated semiconductor oxide are determined by two competing mechanism; i) bandgap narrowing due to electron-electron and electron-impurity effects on the valance and conduction bands (> 3.38eV), ii) bandgap widening by the Burstein-Moss effect, a blocking of the lowest states of the conduction band by excess electrons(< 4.15eV). The resistivity of ITO layer obtained about 6 x 10^{-4}Ω㎝ at 4% of oxygen flow. In case of decrease resistivity of ITO, the carrier concentration and carrier mobility of ITO film will be increased. The contact resistance of ITO/Si with shallow doped emitter was measured by the transmission line method(TLM). As an experimental result, the contact resistance was obtained 0.0705Ω㎠ at 2% oxygen flow. It is formed ohmic-contact of interface ITO/Si substrate. The emitter series resistance of ITO/Si with shallow doped emitter was obtained 0.1821Ω㎠. Therefore, As an PC1D simulation result, the fill factor of EWT solar cell obtained above 80%. The details will be presented in conference.

Key words : TCO(투명전극), EWT solar cells

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