PVD 코팅법에 의한 ZnO제조 및 특성

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Preparation and characterization of Zinc Oxide films deposition by (PVD)

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Transparent conducting ZnO films were deposited to apply DSSC Substrate on glass substrates at 500℃ by ionbeam-assisted deposition. Crystallinity, microstructure, surface roughness, chemical composition, electrical and optical properties of the films were investigated as a function of deposition parameters such as ion energy, and substrate temperature. The microstructure of the polycrystalline ZnO films on the glass substrate were closely related to the oxygen ion energy, arrival ratio of oxygen to Zinc Ion bombarded on the growing surface. The main effect of energetic ion bombardment on the growing surface of the film may be divided into two categories; 1) the enhancement of adatom mobility at low energetic ion bombardment and 2) the surface damage by radiation damage at high energetic ion bombardment. The domain structure was obtained in the films deposited at 300 eV. With increasing the ion energy to 600 eV, the domain structure was changed into the grain structure. In case of the low energy ion bombardment of 300 eV, the microstructure of the film was changed from the grain structure to the domain structure with increasing arrival ratio. At the high energy ion bombardment of 600 eV, however, the only grain structure was observed. The electrical properties of the deposited films were significantly related to the change of microstructure. The films with the domain structure had larger carrier concentration and mobility than those with the grain structure, because the grain boundary scattering was reduced in the large size domains compared with the small size grains. The optical transmittance of ZnO films was dependent on a surface roughness. The ZnO films with small surface roughness, represented high transmittance in the visible range because of a decreased light surface scattering.. By varying the ion energy and arrival ratio, the resistivity and optical transmittance of the films were varied from 1.1×10^{-4} to 2.3×10^{-2} Ω cm and from 80 to 87%, respectively. The ZnO film deposited at 300 eV, and substrate temperature of 500℃ had the reisitivity of 1.1×10^{-4} Ω cm and optical transmittance of 85% in visible range. As a result of experiments, we provides a suggestition that ZnO thin Films can be effectively used as the DSSC substrate Materials.

Key words : ZnO Thin film, PVD Coating, IBAD(Ion beam assisted Molecular Beam Epitaxy)

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TIO_2 전극의 소결온도에 따른 DSSCS 제조 및 성격

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Preparation and characterization of $Ti0_2$ Thin Film By Various temperature

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염료감응형 태양전지의 효율을 향상을 시키기 위하여, 이산화티타니아박막을 doctor-blade 방법으로 FTO 기판위에 15-16um 코팅을 한뒤, 다른 온도의 400℃ -600℃ 범위에서, 소결을 하였다. 상대전극은 FTO 기판위에 5Ml의 Pt용액을 가지고, 450℃온도에서 제작을 하였다. 실험의 결과 이산화티타니아의 표면거칠기 및 입자사이즈의 소결의 형상에 따라 DSSC의 효율의 상관관계가 영향을 받았다. 표면의 형상은 AFM으로 측정을 하였으며,표면의 단차가 RMS 의 값이 7nm이하 일 때, 효율의 향상을 이루었다. 실험결과 500 ℃ 이하일 때, 상대적으로 낮은 open circuit voltage를 이루었으며, 낮은 Fill-factor를 이루었다. 500℃이상의 온도에서는 상대적으로 높은 high circuit voltage와 높은 fill factor를 나타내었다. 실험결과 500℃에서 소결된 전극을 가진 DSSC가 단락의 전압과 개방전류가 상호보완된 적정값을 가져 가장 개선된 FF와 Eff를 나타내었다. 이와 같은 특성은 이산화티타니아의 준위 모식도에서 설명이 될수 있고, 이산화티타니아의 최적의 necking 및 pore, 입자크기등이 제어될수 있음을 의미한다.

Key words : $Ti0_2$ Thin film, Doctor Blade Coating, DSSC SOLAR CELL/

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