

RTP 공정을 통한 태양전지용 AZO 박막의 후열처리 특성연구

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A Study on Properites of PV Solar cell AZO thin films post-annealing by RTP technique

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In this paper, ZnO:Al thin films with c-axis preferred orientation were prepared on Soda lime glass substrates by RF magnetron sputtering technique.

AZO thin film were prepared in order to clarify optimum conditions for growth of the thin film depending upon process, and then by changing a number of deposition conditions and substrate temperature conditions variously, structural and electrical characteristics were measured. For the manufacture of the AZO were vapor-deposited in the named order.

It is well-known that post-annealing is an important method to improve crystal quality. For the annealing process, the dislocation and other defects arise in the material and adsorption/decomposition occurs. The XRD patterns of the AZO films deposited with grey theory prediction design, annealed in a vacuum ambient (2.0×10^{-3} Torr) at temperatures of 200, 300, 400 and 500°C for a period of 30min. The diffraction patterns of all the films show the AZO films had a hexagonal wurtzite structure with a preferential orientation along the c-axis perpendicular to the substrate surface. As can be seen, the (002) peak intensities of the AZO films became more intense and sharper when the annealing temperature increased.

On the other hand, When the annealing temperature was 500°C the peak intensity decreased. The surface morphologies and surface toughness of films were examined by atomic force microscopy (AFM, XE-100, PSIA). Electrical resistivity, Gall mobility and carrier concentration were measured by Hall effect measuring system (HL5500PC, Accent optical Technology, USA). The optical absorption spectra of films in the ultraviolet-visible-infrared (UV-Vis-IR) region were recorder by the UV spectrophotometer (U-3501, Hitachi, Japan). The resistivity, carrier concentration, and Hall mobility of ZnS deposited on glass substrate as a function of post-annealing.

감사의 글 : 본 연구는 호남광역경제권 선도산업지원단 연구비 지원에 의한 것입니다.

Key words : RF Sputtering, Thin film, AZO, Solar cell

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박막태양전지용 ZnO:Al 투명전도막 표면 Self-Texturing 연구

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Study of Self Texturing on ZnO:Al TCO surface for Thin-Film Solar Cell

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본 연구에서는 RF Magnetron Sputtering System을 이용하여 ZnO계 투명전도막 증착시 Vaporization된 MeOH를 유입함으로써 박막증착과 동시에 표면의 Roughness를 제어하여 이에따른 전기적 특성 및 광학적 특성의 개선에 대하여 연구하였다. 실험방법으로 기존의 RF Magnetron Sputtering System에 Vaporization이 가능한 Ultrasonic을 이용하여 MeOH를 Vaporized시켜 MFC Controll을 통해 챔버에 유입하여 ZnO계 투명전도막의 박막증착과 동시에 표면 Texturing을 하였다. ZnO계 투명전도막의 박막증착시 Vaporized MeOH의 유입에 따른 광학적 특성변화를 UV-visible-nIR spectrometry로 조사하였으며, 전기적 특성 변화를 4-Point-Probe로 조사하였으며, 표면적 특성 변화를 Atomic Force Microscope (AFM), Scanning Electron Microscopy (SEM)를 조사하였으며, 박막의 결정성장 특성 변화를 X-ray Diffraction (XRD)으로 조사하였으며, Vaporized MeOH 유입에 따른 박막의 성분분석을 Secondary Ion Mass Spectrometry (SIMS)로 조사함으로써 최적의 조건 및 공정을 확립하였다.

Key words : Solar Cell (태양전지), Transparent conductive oxide (투명전도막)