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Intermediate band solar cells with ZnTe:Cr thin films grown on p-Si substrate by pulsed laser deposition

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Low-cost, high efficiency solar cells are tremendous interests for the realization of a renewable and clean energy source. ZnTe based solar cells have a possibility of high efficiency with formation of an intermediated energy band structure by impurity doping. In this work, ZnO/ZnTe:Cr and ZnO/i-ZnTe structures were fabricated by pulsed laser deposition (PLD) technique. A pulsed (10 Hz) Nd:YAG laser operating at a wavelength of 266 nm was used to produce a plasma plume from an ablated a ZnTe target, whose density of laser energy was 10 J/cm2. The base pressure of the chamber was kept at approximately 4x10-7 Torr. ZnTe:Cr and i-ZnTe thin films with thickness of 210 nm were grown on p-Si substrate, respectively, and then ZnO thin films with thickness of 150 nm were grown on ZnTe:Cr layer under oxygen partial pressure of 3 mTorr. Growth temperature of all the films was set to 250 ℃. For fabricating ZnO/i-ZnTe and ZnO/ZnTe:Cr solar cells, indium metal and Ti/Au grid patterns were deposited on back and front side of the solar cells by using thermal evaporator, respectively. From the fabricated ZnO/ZnTe:Cr and ZnO/i-ZnTe solar cell, dark currents were measured by using Keithley 2600. Solar cell parameters were obtained under Air Mass 1.5 Global solar simulator with an irradiation intensity of 100 mW/cm2, and then the photoelectric conversion efficiency values of ZnO/ZnTe:Cr and ZnO/i-ZnTe solar cells were measured at 1.5 % and 0.3 %, respectively.

Keywords: Pulsed laser deposition, Intermediate band solar cell, ZnTe:Cr

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플렉서블 가스 센서 응용을 위한 화학기상증착법 기반 MoO_3 박막 합성

손주현[1], 안치성[2], 김형우[2], 박기범[1], 김기중[1], 신혜지[1], 김태성[1,2]

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산업 발달에 따라 여러 유해 가스들의 양이 많아지고 그 종류가 다양해지고 있다. 이에 따라 가스센서의 필요성도 더욱 증가 하였고, 이러한 변화에 대응하기 위해 기존 가스 센서로 이용되던 SnO_2나 ZnO보다 더 나은 화학정 안정성과 내구성을 얻고자 2D MoO_3 박막의 대면적 합성을 연구를 진행하였다.

기존 MoO_3 합성에 사용되던 Pyrolysis 방식이 아닌, 플라즈마 화학기상증착법(PECVD)을 이용해 공정과정을 단순화시켜 센서 수율 증대를 목표로 하였다.

E-beam avaporator을 이용해 Mo 금속 박막을 SiO_2 기판 위에 증착시킨 후 O_2 플라즈마를 이용한 Implantation 방식으로 박막을 합성하였고, 라만 분광법, X-ray 광전자 분광법(XPS)을 통해 MoO_3 박막이 nm단위로 합성된 것을 확인하였다. 이를 바탕으로 MoO_3 박막을 2D 가스센서의 소재로 적용하는 것이 가능할 것이라고 예상된다.

Keywords: MoO3, PECVD, Gas sensor