Cadmium selenide 영향에 따른 poly(3-hexylthiophehe):[6,6]-phenyl C_{61} butyric acid methyl ester 유기태양전지 특성 분석

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Characterization of effects of cadmium selenide on the performance of poly(3-hexylthiophehe):[6,6]-phenyl C_{61} butyric acid methyl ester organic solar cells

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We studied the performance of CdSe nanoparticle in the active layer of organic photovoltaics (OPVs) by changing concentration of the CdSe NPs in the P3HT:PCBM layer. We observed that the absorption peak value gradually increases with the increasing amount of CdSe NPs at 600nm wave length. However, the electrical properties of OPVs correspond less with the tendency of UV/visible result. The highest performance was shown with 10% of CdSe NPs. The device performance decreased after 10% of CdSe NPs, this shows the dependencies of performanc of hybrid solar cells on the CdSe NPs loading amount. The resulting OPVs with 10 % of CdSe NPs show a short circuit current density (J_{sc}) of 6.96mA/cm^2, open circuit voltage (V_{oc}) of 0.61V, fill factor (FF) of 0.59, and power conversion efficiency (PCE) of 2.53% under AM 1.5 (100mW/cm^2).

Key words : P3HT, PCBM, Organic solar cell(유기태양전지), CdSe(카드뮴셀레나이드)

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염료감응형 태양전지의 광전극 적용을 위한 TiO_2 nanoparticle 특성 분석

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Study on TiO_2 nanoparticle for Photoelectrode in Dye-sensitized Solar Cell

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Dye-sensitized solar cells (DSSC) have recently been developed as a cost-effective photovoltaic system due to their low-cost materials and facile processing. The production of DSSC involves chemical and thermal processes but no vacuum is involved. Therefore, DSSC can be fabricated without using expensive equipment. The use of dyes and nanocrystalline TiO_2 is one of the most promising approaches to realize both high performance and low cost. The efficiency of the DSSC changes consequently in the particle size, morphology, crystallization and surface state of the TiO_2. Nanocrystalline TiO_2 materials have been widely used as a photo catalyst and an electron collector in DSSC. Front electrode in DSSC are required to have an extremely high porosity and surface area such that the dyes can be sufficiently adsorbed and be electronically interconnected, resulting in the efficient generation of photocurrent within cells. In this study, DSSC were fabricated by an screen printing for the TiO_2 thin film. TiO_2 nanoparticles characterized by X-ray diffractometer (XRD) and scanning electron microscope (SEM) and scanning auger microscopy (SAM) and zeta potential and electrochemical impedance spectroscopy(EIS).In addition, DSSC module was modeled and simulated using the SILVACO TCAD software program. Improve the efficiency of DSSC, the effect of TiO_2 thin film thickness and TiO_2 nanoparticle size was investigated by SILVACO TCAD software program.

Key words : DSSC(염료감응형 태양전지), Photoelectrode(광전극), TiO_2(티타니아), TiO_2 nanoparticle(TiO_2 나노입자)

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