EW-P005

Improved Photovoltaic Performance of Inverted Polymer Solar Cells using Multi-functional Quantum-dots Monolayer

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Interfacial engineering approaches as an efficient strategy for improving the power conversion efficiencies (PCEs) of inverted polymer solar cells (iPSCs) has attracted considerable attention. Recently, polymer surface modifiers, such as poly(ethyleneimine) (PEI) and polyethylenimine ethoxylated (PEIE), were introduced to produce low WF electrodes and were reported to have good electron selectivity for inverted polymer solar cells (iPSCs) without an n-type metal oxide layer. To obtain more efficient solar cells, quantum dots (QDs) are used as effective sensitizers across a broad spectral range from visible to near IR. Additionally, they have the ability to efficiently generate multiple excitons from a single photon via a process called carrier multiplication (CM) or multiple exciton generation (MEG). However, in general, it is very difficult to prepare a bilayer structure with an organic layer and a QD interlayer through a solution process, because most solvents can dissolve and destroy the organic layer and QD interlayer. To present a more effective strategy for surpassing the limitations of traditional methods, we studied and fabricated the highly efficient iPSCs with mono-layered QDs as an effective multi-functional layer, to enhance the quantum yield caused by various effects of QDs monolayer. The mono-layered QDs play the multi-functional role as surface modifier, sub-photosensitizer and electron transport layer. Using this effective approach, we achieve the highest conversion efficiency of ~10.3% resulting from improved interfacial properties and efficient charge transfer, which is verified by various analysis tools.

Keywords: Organic Photovoltaic, CdSe, ZnO@graphene, Monolayer

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Fabrication and characteristics of the flexible DSSC

최은창, 최원창, 위진욱, 홍병유

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Dye-sensitized solar cells (DSSCs) have been widely investigated as a next generation solar cell because of their simple structure and low manufacturing cost. To realize a commercially competitive technology of DSSCs, it is imperative to employ a technique to prepare nanocrystlline thin film on the flexible organic substrate, aiming at increasing the flexibility and reducing the weight as well as the overall device thickness of DSSCs. The key operation of glass-to-plastic substrates conversion is to prepare mesoporous TiO2 thin film at low temperature with a high surface area for dye adsorption and a high degree of crystallinity for fast transport of electrons. However, the electron transport in the TiO2 film synthesized at low temperature is very poor. So, in this study, TiO2 films synthesized at high temperature were transferred on the selective substrate. We fabricated DSSCs at low temperature using this method. So, we confirmed that the performance of DSSCs using TiO2 films synthesized at high temperature was improved.

Keywords: flexible DSSC, low temperature