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Interfacial Layers for High Efficiency Polymer Solar Cells

Younsung Kim, Hana Choi, Seon Kyoung Son, Tahee Kim, Bongsoo Kim, Kyungkon Kim

Korea Institute of Science and Technology

Polymer solar cells utilize bulk heterojunction (BHJ) type photo-active layer in which the electron donating polymer and electron accepting C60 derivatives are mixed together. In the BHJ system the electron donating polymer and electron accepting C60 derivatives are blended. The blended system causes charge recombination at the interface between the BHJ active layer and electrode. To reduce the charge recombination at the interface, it is needed to use an interlayer that can selectively transfer electrons or holes. We have developed solution processable wide band gap inorganic interfacial layers for polymer solar cells. The effect of interlayers on the performance of polymer solar cell was investigated for various types of conjugated polymers. We have found that inorganic interfacial layers enhanced the solar cell efficiency through the reduction of charge recombination at the interface between active layer and electrode. Furthermore, the stability of the polymer solar cell using the interlayer was significantly improved. The efficiency of 6.5% was obtained from the PTB7:PCBM70 based solar cells utilizing TiO₂ nanoparticles as an interlayers.

Keywords: Polymer Solar Cell, Organic Photovoltaics, Interfacial Layers