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Improved Efficiency of Polymer Solar Cells by mean of Coating Hole Transporting Layer as Double Layer Deposition

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Polymer solar cells is one of the promising technologies that gain tremendous attentions in the field of renewable energy. Optimization of thickness for each layer is an important factor determining the efficiency of the solar cells. In this work, the optimum thickness of Poly(3,4-ethylenedioxythione) : poly(styrenesulfonate) (PEDOT:PSS), a famous material widely used as hole transporting layer in polymer solar cells, is determined through the consideration of device's power conversion efficiency (PCE). The structure of ITO/PEDOT:PSS/PCDTBT:$PC_{71}BM$/Tio_x/Al was employed to fabricate the solar cells by rapid convective deposition. The thickness of PEDOT:PSS layer was varied via the deposition speed. Furthermore, double layer deposition of PEDOT:PSS was introduced as an approach to improve solar cell efficiency. To confirm the enhancement of solar cell efficiency, PEDOT:PSS films were characterized by the combinations of microscopic and spectroscopic techniques. The results obviously reveal that, with the optimized thickness, the PCE of the device reaches 4.03%. Interestingly, using double layer deposition of PEDOT:PSS shows the ability to enhance the performance of the solar cells to 6.12% under simulated AM 1.5G illumination of 100 mW/cm^2.

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