PCIV-4 PERFORMANCE OF ORGANIC PHOTOVOLTAIC DEVICES

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Recently, photovoltaic devices based on conjugated semiconducting polymer have an attention due to the possibility of low-cost, flexibility, and easy process for large area. We have studied the performance of photovoltaic devices with light absorbers based on the conjugated polymers, poly[2-methoxy-5-(3,7-dimethyloctyloxy)-1,4-phenylenevinylene] (MDMO-PPV) and regioregular poly(3-hexylthiophene) (P3HT), each blended with the acceptor-type methanofullerene phenyl-C61-butyric acid methyl ester (PCBM). The photovoltaic devices with different thickness of MDMO-PPV:PCBM, from 65 nm to 150 nm were fabricated. The trade-off between optical absorption in organic layers and the charge transport of photogenerated charges determined the optimal photocurrent. The open circuit voltage and the fill factor showed little change upon the thickness of active layer. The peak of photocurrent and the power conversion efficiency was showed in the range from 100 nm to 125 nm.

The efficiencyof the devices with P3HT:PCBM active layer was significantly improved by a heat treatment. We obtained open circuit voltage of 0.61 V, short circuit currentdensity of 6.90 mA/cm2 and fill factor of 0.55 under 100 mW/cm2 air-mass 1.5 solar simulator illumination, yielding a 2.33% power conversion efficiency.

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