PHOTOVOLTAIC STUDIES ON IONICALLY SELF-ASSEMBLED MONOLAYER THIN FILM DEVICES BASED ON CONDUCTING POLYMERS

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Research on optoelectronic devices based on organic materials has gained worldwide attention due to their mechanical flexibility, low-cost, light weight and tunability of key material parameters.

We report here some photovoltaic studies on polymer-based thin film devices made using ISAM technique. Using this technique the thickness and individual composition of layers can be controlled in a nanometer scale. In the fabrication of these devices bi-layers of electron donor/electron acceptor materials were deposited on ITO-coated glass slides and aluminium was used as the other contact. We studied two systems PPV/PTAA (paraphenylene vinylene / polythiophene 3-acetic acid) and PPV/PMA (paraphenylene vinylene / polymethacrylic acid). Here PPV acts as the electron donor and PTAA or PMA acts as the electron acceptor. A layer of transparent PEDOT (poly-3, 4-ethlenedioxythiophene) was deposited on ITO glass before the fabrication of the device in order to smoothen the ITO surface and to reduce the barrier for charge transport between the electrode and the active polymer layer. The PEDOT layer considerably improves the I-V characteristics of the devices. The open circuit voltage of PPV/PTAA devices improve from 0.4 V to 0.8 V after the introduction of the PEDOT layer whereas PPV/PMA devices which had very poor illuminated I-V characteristics improved to have an open circuit voltage of about 0.8 V. The efficiency of these devices however was about 2%.