

The influence of non-toxic PEIE in organic photovoltaics

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Polyethylenimine ethoxylated (PEIE) is known as a kind of polymer material with high content of amine groups in the polymer structures. Using non-toxic PEIE layer as an electron transport layer in the fabrication process is the initial motivation of this study. According to the results, the improvement in current density–voltage characteristics and external quantum efficiency of organic photovoltaics with non-toxic PEIE as a modified layer were demonstrated. In order to investigate the influence of PEIE layer, the mechanisms of carrier transport, photon generation current, and the carrier recombination were systematically studied. From capacitance-voltage measurement, the effective capacitance of the device increases with an addition PEIE layer, corresponding to the increase of accumulation carriers generated at the interfaces. Furthermore, electrochemical impedance spectroscopy elucidated that the PEIE layer can reduce the carrier recombination probability in the devices. As a result, the lifetime of the devices with a PEIE layer is improved as compared to the devices without PEIE layer.