

عنوان مقاله:

Effect of Poly(3-Hexylthiophene):Mixed Fullerene Indene-C<sub>60</sub> Multi-Adducts Ratios on the Performance of Organic Solar Cells

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خلاصه مقاله:

In this study, poly(3-hexylthiophene) (P3HT) and fullerene Indene-C<sub>60</sub> multi-adducts (IC<sub>x</sub>A) were blended to create a formulation as a solution and thin films, which were prepared under ambient conditions. The optical properties of various compositional ratios were studied using UV-Visible absorbance and photoluminescence (PL) measurements. The energy gaps of the prepared thin films and solutions were determined, and their values increased with increasing fullerene ratio because of the isolation of P3HT chains from their neighbors. Intensity ratio (IC=C/IC-C) with a small value in addition to a low value of full width at high maximum (FWHM) of Raman spectra are associated with increased conformation and high aggregation of composition. Furthermore, according to X-ray diffraction (XRD) results the 1:0.8 and 1:0.6 ratios have the largest crystallite sizes in comparison to the other ratios. The highest occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO) levels for blends by electrochemical measurements were determined, which are sandwiched between those of the pure materials. In ambient conditions, binary organic photovoltaic cells (OPVs) at different ratios of the photoactive layer were evaluated. The device with a ratio of 1:0.6 had the best performance, with power conversion efficiency (PCE) of 1.21 %, open circuit voltage (VOC) of 0.53 V, short circuit current density (JSC) of 5.71 mA.cm<sup>-2</sup>, and fill factor (FF) of 39.5 % at a small Vloss of 1.39 V

کلمات کلیدی:

.Organic photovoltaics, Photoluminescence, X-ray diffraction, Raman spectrum, Cyclic Voltammetry

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