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Thickness and Solvent influence on the photo-active layer in Organic photovoltaic devices

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Abstract content
   (Max 300 words)

Abstract

To date, organic photovoltaic (OPV) devices made from a blend of conjugated polymers such as poly(3-hexylthiophene-2,5-diyl), (P3HT) and fullerene derivative [6,6]-phenyl C60 butyric acid methyl ester (PCBM) have attracted much attention because of their promising improvement of power conversion efficiencies. In this study, we investigate the effect of solvent on the fabrication of photo-active layers (P3HT:PCBM) in OPV devices. Dissolving the photo-active materials in Chloroform, 1,2 dichlorobenzene and chlorobenzene solvents, optical absorption of blended films was evaluated and thin films made from chloroform showed intense absorption compared to 1,2-dichlorobenzene and chlorobenzene. Surface profile determined by Alpha-step IQ showed thin films of thickness of about 138.8 nm (chloroform), 56,1 nm(1,2-dichlorobenzene) and 75.2 nm (chlorobenzene). The OPV devices comprised of an active layer P3HT:PCBM blend, sandwiched between a transparent conductive oxide (ITO) coated glass as a anode and a top metal layer (Al) as an cathode giving the device configuration of ITO|PEDOT:PSS|P3HT:PCBM|Al. The current density-voltage (J-V) characteristics measured with a solar simulator calibrated with a silicon-based reference cell providing an AM 1.5G spectra at 100mW/cm2 and external quantum efficiencies (EQE) measured using incident photo-to-current efficiency measurement system are discussed. The maximum power conversion efficiency of ˜ 3.45 % was obtained from the device fabricated using chloroform as a solvent, while the power conversion efficiencies of ˜2.94 % and ˜2.86 % were obtained when chlorobenzene and 1,2-dichlorobenzene were used, respectively, as solvents.

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Yes

Level for award
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PhD

Main supervisor (name and email)
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Prof. O.M Ntwaeaborwa

Would you like to
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