

Abstract Submitted
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Electroabsorption spectroscopy of bulk heterojunction solar cells

MARIAN TZOLOV, Lock Haven University — Bulk heterojunction solar cells were fabricated using PCPDTBT polymer and PCBM in inert atmosphere. Electroabsorption (EA) spectroscopy was performed in the spectral range 350-1000 nm using detection at the first harmonic of the modulation frequency. The first derivative of the optical absorbance spectra explains satisfactory most of the bands in the EA spectra. The only deviation is in the spectral range around 760 nm. Control experiments with device structures containing only a PCPDTBT film confirm that the band at 760 nm is associated with the presence of PCBM, despite that pristine PCBM is not expected to have such spectral band. We show that electrical DC bias strongly affects this band. Negative DC bias almost completely eliminates this band, while positive bias enhances it further. We interpret the band at 760 nm as due to photogenerated charge carriers trapped at defect states or at interfaces within the composite PCPDTBT/PCBM film. Our interpretation is supported further by the current voltage characteristics, impedance spectra, photocurrent spectra, frequency dependence and DC bias dependence of the EA signal. The effective transfer of photogenerated charge carriers between PCPDTBT and PCBM is confirmed by the quenching of the photoluminescence in the composite film.

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