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Majvor Mack

EHF - OEO

Determination of the correct IQE and charge carrier mobility in SQIB:PCBM cells

To investigate the loss mechanisms in organic solar cells the correct determination of the internal quantum efficiency (IQE) and the evaluation of the charge carrier mobility are important. Imbalanced or low mobilities lead to a built up of space charge and therefore to increased bimolecular recombination and a lower fill factor FF. To address this issue, the mobility is determined from I-V-measurements of single carrier devices, which follow the Mott-Gurney/Murgatroyd law for space-charge limited current (SCLC) [1]. Determining the IQE helps to disentangle electronic from optical processes in organic solar cells and thereby helps to gain further understanding of the device performance, e.g. impact of geminate recombination losses, provided that parasitic absorptions are considered. It becomes possible through transfer matrix optical modelling to determine the active layer's contribution to the total absorption of the device [2]. For this the optical constants and thicknesses of all layers within the device stack are determined by spectroscopic ellipsometry.

[1] J. C. Blakesley et al. , Org. Electron. 15 (2014) 1263.

[2] G.F. Burkhard, E.T. Hoke, M.D. McGehee, Adv. Mater. 22 (2010) 3293.