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Intrinsic series resistance of organic photovoltaic devices NON THONGPRONG, PHILLIP DUXBURY , Michigan State Univ — Bilayer organic photovoltaics (OPV) are theoretically and computationally studied in order to find intrinsic physical origins of series and parallel resistances; R_s and R_p. New current density-voltage (J-V) characteristic equations were derived in a similar manner to the work by Giebink et al., using reasoning based on electron and hole quasi-Fermi energies. We also developed a computational model combining previous developments by Koster et al. and Barker et al. with the interface model of Giebink et al. The computational model reveals that there are space charge regions around the donor-acceptor interface. These regions are the cause of an intrinsic R_s due to their low carrier density which induces a shift of the quasi-Fermi levels from the electrode work functions. Recombination of charge transfer excitons (polaron pairs) across the interface can be viewed as a leakage path. An intrinsic origin of R_p in this model is then polaron pair recombination. Both resistances are dependent on the applied voltage and these dependences are calculated using our computational model. The analysis is extended to include the presence of traps, yielding expressions for R_s, R_p and for the ideality factors as a function of applied voltage.

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