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Studying recombination in the bulk heterojunction solar cells using lateral solar cell geometries CHRISTOPHER LOMBARDO, ERIC DANIELSON, ANANTH DODABALAPUR, The University of Texas at Austin — Lateral structures are shown to be a very powerful tool to understand transport and recombination phenomena in bulk heterojunction materials and solar cells. Active layers of phase separated P3HT:PCBM were chosen due to their wide use in research devices and potential for commercialization. Studies of current-voltage curves for varying carrier transit lengths have resulted in information about the movement of charge carriers as well as carrier recombination. By examining typical solar cell parameters (open circuit voltage, short circuit current, fill factor, and power conversion efficiency) combined with photocurrent measurements as a function of electrode spacing, carrier density, applied electric field, and temperature under illumination conditions (0.1 – 100 suns), we have determined how these parameters depend on the carrier concentration, electric field, and temperature. This work provides a clear picture of when bimolecular recombination dominates and also if the recombination is Langevin or non-Langevin.

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