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Two-Dimensional Effects on Lateral Organic Bulk Heterojunction Devices KELLY LIANG, ERIC DANIELSON, Univ of Texas, Austin, ZIEN OOI, Agency for Science, Technology and Research, ANANTH DODABALAPUR, Univ of Texas, Austin — For moderately thick (50 nm) lateral organic bulk heterojunction (OBHJ) photovoltaic devices, a one-dimensional space charge limited current model with electric field independent mobility accurately simulates key device metrics, like photocurrents, mobilities, and bimolecular recombination coefficients. However, as the thickness of these lateral organic devices approach thinner and thicker limits, two-dimensional effects greatly influence device characteristics, and a one-dimensional approximation is no longer sufficient. Both the two-dimensional electric field spreading in the OBHJ semiconductor and the electric field dependent mobility of the material system need to be considered in these devices. Introducing a geometric prefactor–dependent on the thickness of the organic semiconductor, to the one-dimensional space charge limited model accounts and adjusts for the two-dimensional effects. Using this modified and more accurate model, we further examined the photoconduction and photoconductive gain in lateral OBHJ devices and reaffirmed that high gains originate from contact injection rather than bulk photoconduction.

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