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Numerical Simulations of Layered and Blended Organic Photovoltaic Cells SUE CARTER, JAN HAERTER, University of California at Santa Cruz, JOHN SCOTT, IBM Almaden Research Center — We present results obtained from numerical simulations of organic photovaltaic cells as the donor-acceptor morphology evolves from sharply defined layers, to partial blends and finally homogeneous blends. We have employed a simple model that describes exciton dissociation and charge transport in continuously changing material concentrations. As the mixing percentage increases, the exciton dissociation increases and the diffusion counter-current decreases, resulting in substantially greater short circuit currents but reduced open circuit voltages. Blended structures are more sensitive to mobility than layers due to recombination throughout the bulk. Our model indicates that solar power efficiencies greater than 10% can be achieved when the zero-field charge mobilities approach 10^{-3} cm^2/Vs for partially blended structures.

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