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Using stabilized finite elements for understanding the performance of organic solar cells HARI KRISHNA KODALI, BASKAR GANAPATHYSUBRAMANIAN, Iowa State University — Organic solar cells (OSCs) fabricated from polymer blends are a promising alternative to inorganic photovoltaics. Computational modeling of OSCs is of significant utility towards understanding the relationship between topology/ morphology and efficiency. Simulation of OSCs requires determination of electric potential and electron/ hole densities, which is described by Boltzmann Transport Equation (BTE). As the direct solution of BTE is computationally challenging, the drift-diffusion model is used for modeling traditional semiconductor devices. The drift component in the drift-diffusion equations causes large convection instabilities. This is mitigated by 'Streamline Upwind Petrov Galerkin' (SUPG) stabilization traditionally used in convection dominated flow problems in computational fluid dynamics. Although this problem has been addressed for silicon semiconductors, simulation of organic bulk heterojunction (BHJ) solar cells presents new challenges. A comparative study is undertaken for solution of stabilized drift-diffusion equations with primitive, Slotboom and Quasi Fermi Level variables. A simplified drift-diffusion model (with analytical solution) is used to verify these implementations. The framework is utilized to investigate the effect of topology on photocurrent.

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