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**Impact of Resonant Infrared Matrix-Assisted Pulsed Laser Evaporation (RIR-MAPLE) on Morphology and Charge Conduction in Conjugated Polymer and Bulk Heterojunction Thin Films**[1] ADRIENNE STIFF-ROBERTS, RYAN MCCORMICK, AYOMIDE ATEWOLOGUN, Department of Electrical and Computer Engineering, Duke University — An approach to improve organic photovoltaic efficiency is to increase vertical charge conduction by promoting out-of-plane $\pi$-$\pi$ stacking in conjugated polymers. Resonant infrared matrix-assisted pulsed laser evaporation (RIR-MAPLE) features multiple growth parameters that can be varied to achieve a desired organic thin film property. In addition, RIR-MAPLE enables nanoscale domains in blended polymeric films and multi-layer polymeric films regardless of constituent solubility. Thus, RIR-MAPLE deposition is compared to solution-cast films as a possible approach to increase out-of-plane charge transport in polymers and bulk heterojunctions. Two common, solar cell polymers are investigated: P3HT and PCPDTBT. Materials characterization includes grazing-incidence, wide angle x-ray scattering (GIWAXS) for structural information and two techniques to determine hole mobility: organic field effect transistors to measure in-plane mobility and charge extraction by linearly increasing voltage to measure out-of-plane mobility. Initial indications are that the RIR-MAPLE films have a fundamentally different morphology compared to solution-cast films. In the case of P3HT, an enhancement in out-of-plane $\pi$-$\pi$ stacking was observed by GIWAXS in RIR-MAPLE films compared to solution-cast films.

[1]A portion of this research was conducted at CNMS at ORNL.

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