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Fast Printing and In-Situ Morphology Observation of Organic Photovoltaics using Slot-Die Coating FENG LIU, SUNZIDA FERDOUS, UMASS-Amherst, CHENG WANG, ALEXANDER HEXAMER, Lawrence Berkeley National Lab, THOMAS RUSSELL, UMASS-Amherst, THOMAS RUSSELL TEAM, CHENG WANG COLLABORATION — The solvent-processibility of polymer semiconductors is a key advantage for the fabrication of large area, organic bulk-heterojunction (BHJ) photovoltaic devices. Most reported power conversion efficiencies (PCE) are based on small active areas, fabricated by spin-coating technique. In general, this does not reflect device fabrication in an industrial setting. To realize commercial viability, devices need to be fabricated in a roll-to-roll fashion. The evolution of the morphology associated with different processing parameters, like solvent choice, concentration and temperature, needs to be understood and controlled. We developed a mini slot-die coater, to fabricate BHJ devices using various low band gap polymers mixed with phenyl-C71-butyric acid methyl ester (PCBM). Solvent choice, processing additives, coating rate and coating temperatures were used to control the final morphology. Efficiencies comparable to lab-setting spin-coated devices are obtained. The evolution of the morphology was monitored by in situ scattering measurements, detecting the onset of the polymer chain packing in solution that led to the formation of a fibrillar network in the film.

Feng Liu
UMASS-Amherst

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