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Exploiting solvent additives to introduce processability to organic solar cells JAMES ROGERS, KRISTIN SCHMIDT, University of California, Santa Barbara, MICHAEL TONEY, Stanford Synchrotron Radiation Lightsource, GUILLERMO BAZAN, EDWARD KRAMER, University of California, Santa Barbara — Solution processable, highly efficient, organic photovoltaics typically consist of a two component donor-acceptor type system composed of a low bandgap conjugated polymer donor blended with a fullerene acceptor. Efficient charge extraction from these blends demands that donor and acceptor components form nanoscale phase separated percolating pathways to their respective electrodes. Although post deposition thermal annealing has been shown to degrade device performance in low bandgap polymer systems, the incorporation of a small concentration of solvent additive (e.g. diiodooctane) into the solution from which a bulk heterojunction solar cell is cast has been shown to nearly double device efficiency without the need for subsequent thermal annealing. In situ grazing incidence wide angle x-ray scattering measurements as a function of time after spin coating suggest that the role of additives is to induce nucleation of crystals of the polymeric component and to facilitate changes in the correlation length (size and/or perfection) of these crystallites during the film drying process. The resulting structural order in additive processed films suggests novel processing routes for existing organic photovoltaics.

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