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**Characterization of solution structure and its importance in thin film ordering of conjugated block copolymers for organic semiconductor devices** MICHAEL BRADY, SUNG-YU KU, JUSTIN COCHRAN, UC Santa Barbara, CHENG WANG, Lawrence Berkeley National Laboratory, CRAIG HAWKER, EDWARD KRAMER, MICHAEL CHABINYC, UC Santa Barbara — Fully conjugated diblock copolymers (CBCPs) form intriguing materials alternatives to polymer-small molecule blends for their control of mesoscopic order in low-cost organic semiconductor devices. In both bulk heterojunction (BHJ) photovoltaics, consisting of an interpenetrating network with high donor-acceptor interfacial area, and ambipolar transistors, the transport of charge carriers through continuous p- and n-type paths in thin films is a controlling factor in device performance. AFM, GIWAXS, NEXAFS spectroscopy, and RSoXS are used to probe the structure of films of CBCPs with a p-type P3HT block and an n-type DPP block. Thermal annealing in the P3HT melt after casting creates ordered domains with  $\sim 50$  nm in-plane lamellar spacings, as confirmed with GISAXS and RSoXS. GIWAXS diffraction from the (h00) alkyl-stacking and (010) pi-stacking planes shows primarily edge-on orientation for crystals of both P3HT and DPP blocks. In addition, temperature-dependent solution SAXS and UV-Vis spectroscopy are used to probe the size and conformation of casting solution aggregates. Fibrillar DPP aggregates direct the crystallization of P3HT-*b*-DPP following film casting and enable the formation of wormlike domains after annealing and thus ideal morphologies for transport in organic devices.

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