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Nanoscopic Assembly of Organic Semiconductors for Organoelectronic Devices BENJAMIN J. RANCATORE, CLAYTON E. MAULDIN, Department of Chemistry, UC Berkeley, JEAN M.J. FRÉCHET, College of Chemistry, UC Berkeley, TING XU, Department of Materials Science and Engineering, UC Berkeley — Small molecule organic semiconductors have many advantages over their polymer counterparts, including high purity and well-defined electronic properties. To fabricate organoelectronic devices, they need to form smooth thin films with control over their spatial organization to tailor the electronic percolation pathway. A quaterthiophene (4T) containing alkyl and phenolic moieties was hydrogen-bonded to the 4-vinylpyridine groups of a block copolymer, polystyrene-b-poly(4-vinylpyridine) (PS-b-P4VP) or a homopolymer, P4VP. These supramolecules can be readily cast into uniform films where the 4Ts form oriented nanostructures without hindering the charge mobility. We also extended this supramolecular approach to blends of symmetrically and asymmetrically-functionalized organic semiconductors at various mixing ratios. Fundamentally, present studies shine light on how to synergize two self-assembly processes, i.e. molecular ordering of organic semiconductors and microphase separation of BCP, and provide useful guidance toward directed hierarchical assemblies in multi-component systems. Present studies may also open a new route for the fabrication of nanostructured thin films of organic semiconductors using solution processing.

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