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Directing crystallization of organic semiconductors around corners in solution-processed thin films STEPHANIE S. LEE, SAMUEL TANG, Department of Chemical and Biological Engineering, Princeton University, MARSHA LOTH, JOHN E. ANTHONY, Department of Chemistry, University of Kentucky, DETLEF-M. SMILGIES, ARTHUR WOLL, Cornell High Energy Synchrotron Source, YUEH-LIN LOO, Department of Chemical and Biological Engineering, Princeton University — We demonstrate the ability to pre-specify the crystallization direction of triethylsilylethynyl anthradithiophene (TES ADT), an organic semiconductor, in solution-processed thin films. Manipulating the substrate surface energy allows us to control the crystallization rate of TES ADT, which ranges from 9 to 25 μm/s, during solvent-vapor annealing. Grazing-incidence x-ray diffraction experiments on as-spun TES ADT films indicate that the initial in-plane orientation of TES ADT is influenced by the surface energy of the underlying substrate, likely due to the competition between strong molecule-molecule interactions and its wettability on the substrate. By imposing surface energy specific patterns on the substrate prior to the deposition of TES ADT, we can preferentially direct TES ADT crystallization around bends and sharp corners to form channels with high hole mobility for charge transport.

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