Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Controlling the out-of-plane orientation of solution-processed organic semiconductor crystals XIAOSHEN BAI, Department of Chemical Engineering and Materials Science,Stevens Institute of Technology, MEGAN HAND, Mechanical Engineering,Stevens Institute of Technology, JACK LY, ALEJANDRO BRISENO, Department of Polymer Science and Engineering, University of Massachusetts, Amherst, STEPHANIE LEE, Department of Chemical Engineering and Materials Science, Stevens Institute of Technology — We demonstrate the ability to control out-of-plane orientation of small-molecule bis(triisopropylsilylethynyl) pyranthrene (TIPS-PY) crystals drop cast from the solution phase onto SiO_2 substrates. By tuning solvent-molecule interactions through the incorporation of varying amounts of an anti-solvent during drop casting, we observed a systematic change in the crystal morphology from cross-shaped crystals to needle like crystals using optical microscopy and scanning electron microscopy. 2-D x-ray diffraction experiments revealed that this change in crystal morphology corresponded to a change in the crystallographic orientation of the crystals, from one in which the (l00) plane is parallel to the substrate surface to one in which the (00l) plane is parallel to the substrate surface. Tuning molecule-substrate interactions by modifying the surface energy of the underlying substrate was also found to affect the observed crystal orientation. Because organic semiconductor crystals display large charge transport anisotropies along different crystallographic directions, it is expected that the out-of-plane charge mobility will depend on the TIPS-PY crystal orientation.

Xiaoshen Bai
Department of Chemical Engineering and Materials Science

Date submitted: 06 Nov 2015 Electronic form version 1.4