Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Strain-stabilized organic semiconductor thin films leads to mobility enhancement YANG LI, JING WANG, The University of Vermont, DETLEF-M. SMILGIES, Cornell High Energy Synchrotron Source, Cornell University, RICHARD SUN, Angstrom Sun Technologies Inc., RANDALL HEADRICK, The University of Vermont — Optical reflection spectroscopy and grazing incidence wide angle X-ray diffraction are used to study the structure evolution of 6,13-bis(trisopropylsilylethynyl)-pentacene thin films versus deposition temperature. Strain-free solid films exhibit a temperature-dependent blue shift of absorption peaks due to a continuous thermally driven change of the crystalline packing. The strain-stabilization of the high-mobility polymorph known as Form II has been studied in detail. As crystalline films are cooled to room temperature they become strained although cracking of thicker films is observed, which allows the strain to partially relax. Below a critical thickness, cracking is not observed and the films are constrained to the lattice constants corresponding to the temperature at which they were deposited. To study the strain effect on the mobility, aligned thin films are obtained in a temperature range from 25C to 135C. Blending polar solvents with different vapor pressures leads to well aligned, extremely thin films (<30 nm). We observed that the mobility is greatly improved when the film is more strained. The effect of strain and gate voltage on contact resistance will be studied and reported.

Yang Li
Univ of Vermont

Date submitted: 11 Nov 2016 Electronic form version 1.4