Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Sorting Category: 23.1.1 (E)

Quantitative structural analysis of organic thin film deposition: a real time synchrotron X-ray scattering study

ISHVIENE COUR, Materials Science Program, Department of Physics, University of Vermont, Burlington, VT-05405, CHRISTIAN SCHLEPUETZ, YONGSOO YANG, Department of Physics, University of Michigan, Ann arbor, MI- 48109, SONGTAO WO, Materials Science Program, Department of Physics, University of Vermont, Burlington, VT-05405, RON PINDAK, National Synchrotron light source, Brookhaven National Laboratory, Upton, NY-11973, RANDALL HEADRICK, Materials Science Program, Department of Physics, University of Vermont, Burlington, VT-05405 — Direct writing gives us the ability to deposit films from solution with controlled thickness, grain structure and orientation. We have investigated TIPS-Pentacene films deposited from toluene solution at various speeds via a combination of real time synchrotron x-ray scattering and polarized-light video microscopy. Through video microscopy we observe a well-defined crystallization front that becomes less defined as the writing speed is increased. In synchrotron x-ray scattering we observe that the ordering process is an order of magnitude slower than what is seen under the optical microscope. This discrepancy in the apparent crystallization rate raises questions such as, which part of the film actually rotates the polarized light and becomes visible under crossed polarizers? Observation with varying speeds and substrate temperatures suggest that the crystallization first occurs near the top surface of the drying film, while subsurface regions remain in a disordered state for up to several seconds.

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Date submitted: 28 Jan 2012 Electronic form version 1.4