Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

**Alignment and Reordering of a Block Copolymer by Solvent-Enhanced Laser Thermal Direct Write** JONATHAN SINGER[1], KEVIN GOTRIK[2], Massachusetts Institute of Technology, JAE-HWANG LEE, Rice University, STEVEN KOOI, CAROLINE ROSS, Massachusetts Institute of Technology, EDWIN THOMAS, Rice University — We present an approach for performing rapid local annealing of block copolymer thin films by focused laser spike (FLaSk) zone annealing using a highly-focused circularly polarized visible wavelength laser spot. The absorption of the underlying substrate generates a thermal spike possessing extreme spatial and, with sample motion, temporal gradients (estimated as 100-750 K/$\mu$m and 3,000-75,000 K/s respectively depending on write speed, power, and laser focus). Using these gradients as a driving force for annealing of microphase separation and alignment of the microdomains, a polystyrene-polydimethylsiloxane block copolymer was transformed from a metastable spherical micelle morphology to the bulk equilibrium cylindrical morphology, aligned along the write direction within a region controlled by manipulation of the laser focal plane. The efficacy of this process was further enhanced by incorporation of solvent swelling of the film with toluene vapor by expected mobility, surface energy, and cooling effects. This simultaneous microdomain reordering and alignment was accomplished on the tens of millisecond time scale with larger temporal gradients leading to the highest level of alignment.

[1]Currently at Yale University
[2]Currently at 3M

Jonathan Singer
Yale University

Date submitted: 15 Nov 2013 Electronic form version 1.4