Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

A Novel Non-lift-off Block Copolymer Nanolithography Technique for Etch-damage Susceptible Magnetic Materials A. BARUTH, A. SHANKAR, K. WALSTER, M.D. RODWOGIN, M.J. ERICKSON, M.A. HILLMYER, C. LEIGHTON, University of Minnesota - Twin Cities — Nanolithographic techniques based on self-assembled block copolymer templates offer exceptional potential for fabrication of large-area nanostructure arrays from a wide variety of functional materials. Despite significant progress with control of the template ordering and development of pattern transfer schemes, significant issues exist with common techniques such as lift-off and etching. Here, we demonstrate successful execution of a nanolithographic process based on climate-controlled solvent annealing of easily degradable cylinder-forming poly(styrene-*b*-lactide) block copolymer films that avoids both lift-off, and some of the most challenging aspects of etching. In particular, our overfill/planarize/etch-back scheme leads to retention of robust ferromagnetism even in 24 nm diameter dots of a material ($Ni_{80}Fe_{20}$) that is both magnetically soft and susceptible to etch damage. The result is a large-area array of 24 ± 1.6 nm diameter magnetic nanodots with exceptional hexagonally-close-packed long range order that retain their crystallinity and ~ 70 % of the bulk magnetization. Extensive diffraction, microscopy, magnetometry, and electrical measurements provide detailed characterization of the pattern formation and fidelity. Funded by NSF MRSEC.

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Date submitted: 22 Dec 2011 Electronic form version 1.4