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NEBRASKA CENTER FOR MATERIALS AND NANOSCIENCE
2010 SEMINAR SERIES PRESENTS

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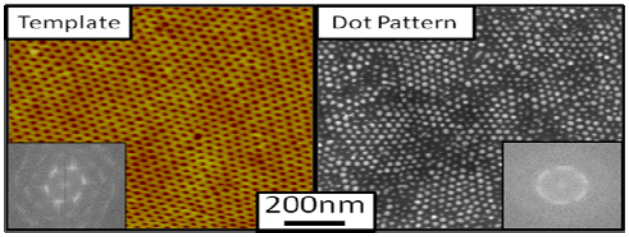
Application of Block Copolymer Patterning to Magnetic Materials

Block copolymers are comprised of two or more homopolymer subunits (*i.e.*, plastic) linked by covalent bonds, yet their mutual immiscibility results in microphase separation leading to the formation of useful periodic nanostructures (spheres, cylinders, lamellar, etc). Nanolithographic techniques based on self-assembled block copolymer templates offer tremendous potential for fabrication of large-area nanostructure arrays. Applying these techniques to magnetic materials will allow for the study of fundamental magnetic properties at the nanometer scale, where new ground states (*i.e.*, single domain, vortices, curling, etc) are observed. In addition, this approach retains a large ensemble of nanostructured features to probe interactions and improve signal-to-noise for magnetic and electronic measurements (both static and dynamic), without the need for expensive and time consuming electron-beam lithographic techniques.

For this reason, the block copolymer approach to nanolithography has huge implications for the progress of bit-patterned magnetic media for ultra high-density storage (>1Tb/in^2). In the case of physical pattern transfer, the production of well-ordered, extremely small (<50nm) features, has been plagued with lift-off (*i.e.*, additive) and etching (*i.e.*, subtractive) complications. In this presentation I will focus on one particular example where we have developed a simple approach incorporating solvent annealing that is additive but does not require a lift-off step. The result is a hexagonally-close-packed array of isolated, 12nm thick, ferromagnetic $Ni_{80}Fe_{20}$ islands with diameters of 35.2 ± 3.3 nm that have been probed with atomic force and electron microscopy, magnetometry and electronic transport. Other ongoing applications of these patterning techniques, including recent advancements in template synthesis, will also be discussed.



Tuesday, September 21, 2010
1:00 p.m.
251 Jorgensen Hall

Host:
Prof. Adenwalla
Physics and Astronomy

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