

UNH Materials Science Seminar

11:10-12:00, Thursday, March 27, 2008

Kingsbury Hall S145

University of New Hampshire

Directed Self-Oriented Self-Assembly of Block Copolymers: Bottom-Up Meeting Top-Down

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As the size scale of device features becomes increasingly smaller, conventional lithographic processes are limited. Alternative routes need to be developed to circumvent this hard stop. Ideally, if existing technological processes are be used with novel materials, significant advances can be made. Block copolymers (BCP), two polymer chains covalently linked together at one end, provide one solution. BCP self-assemble into a range of highly-ordered morphologies, the exact nature of the morphology will depend upon the volume fraction of the components, where with size scale of the features is limited to the size of the polymers chains and are, therefore, nanoscopic in size. However, self-assembly alone is not sufficient. Rather, directed self-orienting self-assembly processes are required to produce devices with the required density and addressability of elements. This requires the design and synthesis of polymers that have well-defined characteristics such that the necessary fine control over the morphology, interfacial properties, and simplicity of processes can be

realized. By combining tailored self-assembly processes, the bottom-up approach, with micro-fabrication processes, the top-down approach, faster, better and cheaper devices can be generated in very simple, yet robust, ways.

Thomas Russell is the Silvio O. Conte Distinguished Professor of Polymer Science and Engineering at the University of Massachusetts Amherst, the Director of the Materials Research Science and Engineering Center on Polymers, the Associate Director of MassNanoTech, Director of a Multi-University Research Initiative on Hierarchically Ordered Materials and an Associate Editor of *Macromolecules*. He has over 400 publications in peer-reviewed journals in the field of polymer science, nanostructured materials, and self-assembly of synthetic and natural nanoparticles and has eight patents in the field. He is a fellow of the American Physical Society and the American Association for the Advancement of Science and has served on and chaired the Solid State Science Committee of the National Research Council, the Executive Committee of the Division of Polymer Physics of the American Physical Society, the Basic Energy Science Advisory Committee of the Department of Energy, the Steering Committee of the Spallation Neutron Source in Oak Ridge Tennessee, the Advisory Committee of the Intense Pulsed Neutron Source at the Argonne National Laboratory, the Advisory Committee for the Los Alamos Neutron Scattering Center and the Advisory Committee for Neutron Research at the National Institute of Standards and Technology. He has received awards from the American Chemical Society, the American Physical Society and the Dutch Polymer Society and was elected to the National Academy of Engineering.

Host: Professor Donald Sundberg x1878