Colloquium of the International
Graduate Research Training Group 1524 – SSNI –

Self-Assembled Soft-Matter Nanostructures at Interfaces

Tuesday, June 24th, 2014, 17.15 h

Technische Universität Berlin
TC-Building, Room PC 203
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„Block Polymer Directed Self-Assembly, and its Application to Nanomanufacturing"

Directed copolymer directed self-assembly (DSA) has emerged as a promising alternative for patterning of integrated circuits at sub-lithographic length scales. Much progress has been made over the past decade, but a number of significant challenges remain. Our efforts at the University of Chicago have focused on development of a molecular based, multiscale computational modeling approach aimed at gaining a fundamental understanding of directed copolymer assembly on patterned substrates. This presentation will begin with an overview of block polymer DSA, a discussion of the state-of-the-art regarding its application in the context of commercial lithographic patterning, and a description of available theoretical and computational approaches. The overview will include a discussion of their advantages and limitations, and will be followed by a presentation of recent modeling advances that have enabled quantitative descriptions of time-dependent, morphological evolution during self-assembly processes, including solvent annealing processes. For such cases, the models capture the selective, time-dependent swelling (or de-swelling) of distinct domains of the copolymer resist material, and are therefore able to describe the path followed by particular blends of copolymers, homopolymers, and solvents, on their way to metastable or equilibrium assembly. Given the predictive nature of such models, some of our recent efforts have gradually focused on the coupling of molecular modeling and evolutionary optimization algorithms. Through that coupling, a new paradigm is emerging in which computations are used to identify surface patterns and block polymer formulations leading to target morphologies and layouts. This presentation will also describe recent efforts to include a description of charged copolymer systems, which are of interest for energy storage, and where the goal is to describe the morphology and the partitioning of charged species in different domains of the polymer, as well as the corresponding interfacial and transport characteristics.

We cordially invite everybody who is interested.

Prof. Dr. Martin Schoen
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