SFB TRR 102

Polymers under Multiple Constraints

Kolloquium

Thursday,

9th July 2015

at: **5.15 pm**

Gustav-Mie-Hörsaal, Theodor-Lieser-Str. 9, 06120 Halle

Coffee will be served from 4.45 pm!

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Natural and Synthetic Polymeric Systems under Nano-Confinement

Controlling the response of polymeric materials against surrounding environment holds promise to engineer novel nanostructured materials. Particularly, constraints imposed by nanometer-scale confinement lead to significant changes in the bulk equilibrium behavior of chained molecules, breaking the symmetry in the assembled structure.

The confinement within thin films can be used to realize bio-nanocomposites by controlling intermolecular interactions between proteins and pairing synthetic chains. We developed a system to demonstrate the in situ fibrillation of □-caseins, amyloidogenic proteins derived from milk, within multilayer films consisting of □-caseins and polyacrylic acid (PAA) prepared by the layer-by-layer (LbL) deposition. Since intermolecular interactions, which play a crucial role in the fibrillation of amyloids, could be finely tuned within the thin film confinement, high aspect ratio amyloid fibrils were obtained with directional uniformity of such fibrils. In addition, we utilized surface-confined amyloid precursors as structural units to achieve free-standing, patternable, monolayered protein-gold nanoparticle composite films in large scale.

Morphologies and morphological transitions of block copolymer (BCP) / homopolymer mixtures under 2D confinement have also been studied. Cylindrical AAO nanopores where diameters are only several repeat-periods of BCP characteristic lengths can impose effective frustration on the microdomain morphology of BCPs. We further extended into BCP / homopolymer binary blends where homopolymers added could release the constraints induced by the confinement. We found that the extent of microdomain transition in the nanoscale confinement is significantly affected by the molecular weight and volume fraction of homopolymers, due to the curvature which polymeric chains experience.

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