CPP 27: Polymer Self Assembly

Time: Wednesday 12:00–13:00 Location: ZEU 160

CPP 27.1 Wed 12:00 ZEU 160

Piezoelectric Properties of Non-Polar Block Copolymers — •Christian W. Pester[1], Markus Ruppel[1,2], Heiko G. Schoberth[1], Volker S. Urban[2], and Alexander Böker[1] — [1]DWI an der RWTH Aachen and Lehrstuhl für Makromolekulare Materialien und Oberflächen, RWTH Aachen, D-52056 Aachen, Germany — [2]Chemical Sciences Division, Oak Ridge National Laboratory (ORNL), Oak Ridge, TN 37831, USA

We elaborate on the effects of electric fields on the domain spacings of poly(styrene-*b*-isoprene) block copolymer nanostructures. Synchrotron Small Angle X-Ray Scattering (SAXS) at the ESRF in Grenoble, France helped us to quantitatively evaluate the interaction between an applied external electric field and domain spacings and allowed the first description of piezoelectric properties in non-polar, non-crystalline soft matter systems, as the domains of both the phase separated and the disordered state react linearly to the strength of the electric field. The distortion is instantaneous, fully reversible and its magnitude compares to other piezoelectric systems. We further study the temperature dependence of this electroactive property and its anisotropic behavior for different chain orientations, which further allowed us important insights into the molecular origin of electric field ↔ polymer chain interactions and the polymer's phase behavior on a microscopic level.

CPP 27.2 Wed 12:15 ZEU 160

Simulation of the co-continuous mesophases in mixtures of triblock copolymers and polymers — •Alexei Karatchentsev and Jens-Uwe Sommer — Leibniz-Institut fuer Polymerforschung, 01069 Dresden, Germany

We model a linear ABA triblock copolymer as a chain of three soft spheres with fluctuating radii of gyration and the distances between their centers of mass [1], [2]. The probability distribution functions for all these quantities that describe a state of the whole molecule were derived in the previous work [1] within the underlying Gaussian chain model. The kinetics of the mesophase separation is driven by a Monte-Carlo algorithm. We simulate the gyroid phase in pure triblock copolymer melts and study in detail its region of stability. Then, we show that adding polymer molecules modeled as soft spheres can stabilize the gyroid structure in triblock copolymer melts and increase its region of stability over that in the pure triblock copolymer systems.

[1] F. Eurich, A. Karatchentsev, J. Baschnagel, W. Dieterich, and P. Maass, J. Chem. Phys. 127, 134905 (2007)

[2] A. Karatchentsev and J.-U. Sommer, "Simulations of the gyroid phase in diblock copolymers with the Gaussian Disphere Model", accepted in J. Chem. Phys.

CPP 27.3 Wed 12:30 ZEU 160

One-dimensional coordination polymers: towards molecular wires — •Inshad Jumh[1], Mohammed S. Alam[1], Viatcheslav Dremov[1], Nina Fischer[2], Nicolai Burzlaff[2], and Paul Müller[1] — [1]Department of Physics & Interdisciplinary Center for Molecular Materials (ICMM), Universität Erlangen-Nürnberg, Germany. — [2]Department of Chemistry and Pharmacy & Interdisciplinary Center for Molecular Materials (ICMM), Universität Erlangen-Nürnberg, Germany.

Wiring on an atomic scale is one of the main goals of modern nanoelectronics. In this context, we studied one-dimensional coordination polymers on insulating surfaces using frequency-modulation atomic force microscopy (FM-AFM). We have deposited a Zn(II) coordination polymer onto mica and silicon oxide surfaces and have observed a significant effect of the surface on the organization of the polymer. On silicon oxide surfaces, linear single polymer strands as well as double helical structures were observed. On mica, however, 2-dimensional networks of intersecting polymer strands were formed. In addition, we have characterized Cu(II) coordination polymers on mica surfaces. However, we could not map a single polymer strands. Instead, we were able to acquire high resolution images of various, more complex patterns. In conclusion, FM-AFM proved to be an effective technique for investigating and classifying potential nanowires under ambient conditions.

CPP 27.4 Wed 12:45 ZEU 160

Superstructuring of bicontinuous foam-like titania nanostructures in thin films — •Martin A. Niedermeier, Florian Schaff, Volker Körstgens, and Peter Müller-Buschbaum — TU München, Physik Department, LS Funkt. Mat., James-Franck-Str. 1, 85748 Garching, Germany

Thin films of nanostructured titania have received a lot of attention in various applications, e.g. photovoltaics. The beneficial influence of superstructures has been successfully demonstrated in the past [1]. A light trapping effect can lead to enhanced absorption in the film which is a highly desirable property for optoelectronical devices. In our approach, thin titania films are prepared via a sol-gel route leading to a well defined bicontinuous foam-like nanostructure which exhibits a high surface to volume ratio. Using cost-efficient printing techniques the superstructure is applied to the polymer/titania composite film using a master. Finally, calcination in ambient air is used to transfer the titania into its anatase phase. The super- and nanostructure of the films are characterized using several imaging techniques like SEM or AFM as well as GISAXS. The crystallinity and the thickness of the films were analysed with XRD and XRR. UV/Vis measurements were conducted to investigate the superstructure's influence on the optical properties of the film. [1] M. Niggeman, et al., Thin Solid Films, 451-452 (2004) 619-623