SYSO 2: Self-Organizing Surfaces and Interfaces II

Time: Wednesday 15:45–17:15 Location: BAR SCHÖ

Invited Talk SYSO 2.1 Wed 15:45 BAR SCHÖ

Crystallisation of polymers at surfaces and in thin films — •Günter Reiter — Physikalisches Institut, Universität Freiburg, Deutschland

Crystallisation is one of the most impressive ways of generating order in molecular systems. However, the morphology of crystals can undergo various transitions, driven by different types of instabilities, yielding diverse patterns at hierarchical length-scales. Here, we focus on morphological transitions for polymer single crystals by studying their growth in quasi 2 dimensions, i.e. in thin films with thicknesses in the range of a single crystalline lamella. Our results are compared with theoretical concepts describing morphological instabilities of single crystals which were originally not developed for polymeric systems. Based on these results, we demonstrate that polymer thin films provide valuable model systems for studying general concepts of crystallization. We identify at which point the connectivity of the crystallizing units within chain-like molecules starts to play a measurable role. For example, in contrast to crystals of small molecules, polymer crystals typically have a wide range of melting temperatures, allowing for paradoxical phenomena like the coexistence of melting and crystallisation. Derived from this fact, we demonstrate that a self-seeding technique enables to generate arrays of correlated polymer crystals of uniform size and shape with their orientation inherited from an initial single crystal. We attribute this unique behaviour of polymers to the coexistence of variable fold lengths in meta-stable crystalline lamellae, typical for ordering of complex chain-like molecules.

Invited Talk SYSO 2.2 Wed 16:15 BAR SCHÖ

Active Organisation of Cell Surface Molecules by Cortical Actin — Kripa Gowrishankar[1], Debanjan Goswami[2], Subhasri Ghosh[2], Abhishek Chaudhuri[1], Bhaswati Bhattacharya[3], Satyajit Mayor[2], and •Madan Rao[1,2] — [1]Theoretical Physics, Raman Research Institute, Bangalore, India — [2]National Centre for Biological Sciences, Bangalore, India — [3]Theoretical Science Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India

The local organization of cell surface molecules is thought to be determined by thermodynamic forces. In particular, interactions with specific lipids are expected to result in protein complexes enriched in lipid-phases called 'rafts'. I will briefly discuss our experimental work on the spatial distribution and steady state dynamics of a putative raft component, the GPI-anchored proteins, using high spatial and temporal resolution FRET microscopy. I will provide evidence that the spatial distribution and dynamics of reorganization of GPI-anchored proteins is regulated by the underlying cortical actin activity. I will next discuss a coarse-grained theoretical approach involving the dynamical interplay between membrane composition and cortical actin activity, based on the framework of active hydrodynamics. Apart from successfully capturing all features of our experimental results, we make testable predictions regarding the nature of fluctuations of cell surface GPI-anchored proteins. Finally, I will discuss consequences of such an active organisation on chemical reaction kinetics and spatial patterning in cell surface signaling.

Invited Talk SYSO 2.3 Wed 16:45 BAR SCHÖ

Phase Behaviour and Dynamics in Lipid Mixtures — •Peter Olmsted — School of Physics & Astronomy, University of Leeds, Leeds, UK

Lipid bilayer membranes are uquitous in biology, and perform a variety of functions, including protection, regulation of chemical gradients, transport, and catalyis. It is apparent that the lipid composition plays an important role in these functions. In this talk I will speak about recent advances (embracing theory, simulation, and experiment) in our group in studying the phase behaviour and mechanics of lipid bilayer membranes of different compositions.