



MAINZ Winter School, Titisee,
January 31st – February 05th 2010

Polymers under Constraints Theory, Experiment and Simulation

Just arrived at the train station on Sunday, Titisee-Neustadt welcomed us with a beautiful winter panorama. On our way to the hotel “Brügger am See” we had to cope with snow-covered streets but were rewarded with a perfect view on the frozen Titisee. The lake has a size of about 1.3km² and is located in the south of the Black Forest about 30km away from Freiburg. Relying on handcrafting and agriculture in former times, we found out that in our days tourism is the most important economy factor.

The scientific program was dominated by lectures on grafted polymer chains. On Monday T. Kreer (Institute Charles Sadron) gave a broad introduction to various models of polymer brushes. Theoretical scaling predictions were confirmed with computer simulations. External shearing forces were introduced by L. Leger (Uni Paris-Sud) on experimental basis and by A. Galuschko (Institute Charles Sadron) via simulations. Among others interpenetration of two opposing polymer brushes were discussed. T. Kuhl (University of California, Davis) and S. Barber (University of California, Davis) focused on similar questions in their lectures showing experimental results from neutron reflectometry and measurements with the surface force apparatus. J. Klein (Weizmann Institute of Science) focused on the shear friction for various types of polymers. In particular, zwitter ion-based chains were of special importance since the corresponding friction coefficient is very low even under large compression forces. This behavior is mainly associated to a strong hydration of the monomers. Finally, the swelling behavior of polymer



brushes was discussed in more detail by P. Theodorakis (Uni Mainz) on a theoretical basis in case of poor solvents. J. R uhe (Uni Freiburg) reported about the influence of other outer parameters like pH or salt concentrations and its use in engineering of microstructured systems.

The physics of single polymer chains under spatial confinement were introduced by Kurt Binder (Uni Mainz) and A. Milchev (Bulgarian Academy of Science). Central questions were: How does a polymer chain move through a pore? How does a polymer chain escape from a two-dimensional gap? Other spatial confinements included two dimensional polymer films (H. Meyer, Institute Charles Sadron) and multi-component systems (M. M uller, Uni G ottingen) like polymer blends or block copolymers.

Another central topic concerned single polymer chains, in particular biopolymers like proteins and DNA strands. R. R. Netz (TU M unchen) and Y. van Hansen (TU M unchen) presented a theoretical study on the absorption properties and unfolding dynamics of proteins while C. M. Marques (Institute Charles Sadron) used bio-adhesive vesicles to induce a spreading of DNA on a substrate.



Leisure time was occupied with lots of winter sports like skiing or sledging. The bowling alley as well as the swimming pool inside the hotel was also frequently used. On Thursday we made an excursion to Freiburg. Although the wind was strong and cold we enjoyed our sight seeing tour and learned all the rules of the “Freiburger B achle“. The day ended with the conference dinner in the oldest tavern in Germany called “Zum Roten B aren“.

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