CPP 24: Transport and Confinement II

Time: Tuesday 15:00–16:00 Location: ZEU 260

CPP 24.1 Tue 15:00 ZEU 260

Anomalous diffusion in bicontinuous microemulsions as a model system for crowded environments — •Oliver Schipper and Thomas Hellweg — Bielefeld University, Germany

The understanding of the diffusive behaviour of proteins in living cells is crucial for the theoretical description of biological processes. As the interior of cells or certain cell organelles is often crowded with molecules, the diffusive behaviour of proteins does not follow the normal Fick type diffusion, where the mean square displacement grows linear in time $\langle x^2 \rangle \propto t$. The diffusion is considered to be 'anomalous': $\langle x^2 \rangle \propto t^\alpha$ (with $\alpha > 1$) [1]. To better understand the dependence of the protein diffusion on a confining environment, we studied the movement of a fluorescent particle (GFP) trough a bicontinuous microemulsion via fluorescence correlation spectroscopy. The sponge like network of the microemulsion, which was characterized via small angle neutron scattering, not only slows down the translational movement of the tracer particle with decreasing domain size but also changes the characteristics of the diffusion from 'Fick like' to 'anomalous'.
[1] T. J. Feder et al., Biophysical journal 1996, 70, 2767-2773.

CPP 24.2 Tue 15:15 ZEU 260

Thermal Diffusivity Measured with a Single Nanoparticle — •André Heber, Markus Selmke, and Frank Cichos — Molecular Nano-photonics Group, Universität Leipzig, Germany

The thermal transport properties in soft matter and biological systems are of high fundamental interest. As these materials are highly heterogeneous spatially resolved measurements such as thermal diffusivity measurements are necessary to gain detailed insights. In addition far-field optical read out is desired to minimize perturbations. We use a single metallic nanoparticle that is heated by an intensity modulated resonant laser beam. This results in a thermal wave around the particle and an accompanying refractive change. The change in the refractive index is detected by a weakly absorbed laser beam. Utilizing recent progress in single particle photothermal microscopy we are able to deduce the thermal diffusivity from the action of the thermal wave on the detection laser. With single particle photothermal microscopy it is possible to measure thermal conductivities in a great variety of materials. This scheme can easily be implemented into conventional optical microscopes.

Invited Talk CPP 24.3 Tue 15:30 ZEU 260

Ion Conducting Polymers for Fuel Cells and Batteries: Where Polymer-chemistry meets Electrochemistry — •Klaus-Dieter Kreuer — Max-Planck-Institut für Festkörperforschung, Stuttgart

Ion conducting polymers may simply be polymers with dissolved salts, acids or bases, but they may also be ionomers or polyelectrolytes in which the ionic groups are part of the polymer structure. In both cases, ionic interactions strongly influence the formation and mobility of ionic charge carriers, selective ionic transport, the visco-elastic behavior and even nano-scale ordering. This presentation provides experimental evidence for these effects in ion conducting polymers, which are used as membrane materials in electrochemical energy conversion and storage devices (fuel-cells and batteries), and the implications for the functioning in these devices are discussed. Based on this understanding, suggestions are being made for the modification of existing and the development of new membrane types.

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