DY 57: Talk S. Egelhaaf

Time: Thursday 9:30–10:00 Location: BH-N 243

Invited Talk DY 57.1 Thu 9:30 BH-N 243

Anomalous Diffusion due to Crowding or External Potentials

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Diffusion is one of the most fundamental processes in physics. Classical Brownian motion implies a mean squared displacement that grows linearly with time. In many situations, however, deviations from the linear time dependence are found. The time dependence becomes nonlinear and the diffusion anomalous, e.g., upon increasing the particle concentration, adding obstacles or imposing an external potential. We experimentally investigate different situations where anomalous diffusion is observed. First, the effect of crowding is studied. The motion of small colloidal tracers is followed in the presence of concentrated colloidal particles, which represent the host matrix. Since this matrix retains some mobility, it slowly rearranges and hence the large particles act as mobile obstacles. The effect of the obstacle mobility on the tracer dynamics is systematically investigated in another experiment. The obstacles are exposed to an external potential created by a light field which allows us to tune the obstacle mobility. In the next step, the effects of crowding and of the external potential are combined. Both, crowding and an external potential, slow down the dynamics. However, their combination leads to a non-monotonic dependence on particle concentration. In all these experiments, the different parameters can be varied systematically in a broad range and quantitative data on the single-particle level are obtained. This allows for a detailed characterization of the observed anomalous diffusion.