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**On the dynamics of polymers in nanocomposites and under confinement**

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Confinement effects in polymer melts may lead to unusual properties. This concerns both, the chain conformation as well as chain dynamics that may be altered due to the surface interactions and changes of topology. Today microscopic studies on the chain level are rare and most of what we know comes from simulations, while experiments addressed mainly macroscopic phenomena. In my presentation I will display neutron scattering data, addressing length and time scales from the single monomer to the entanglement network and beyond. These experiments reveal the basic relaxation rates related to monomeric friction, the intermediate scale Rouse dynamics as well as the entanglement controlled dynamics. Polymer nanocomposites have been investigated at various compositions using filler particles smaller and larger than the polymer size. I will discuss the effects of the filler size and concentration on the polymer conformation as well as on the dynamics on the various important length scales. The effect of confinement was also studied on well defined porous alumina samples which were filled with polyethylene oxide (PEO). Thereby the chain dimensions were much larger or smaller than the lateral pore size  $D$ . While for the long chains an expanded entanglement network is observed, the confinement seems to have a weaker effect on the short chains. In particular we do not observe any corset effect as proposed by NMR relaxometry. As compared to bulk PEO a moderate slowing down in the intermediate time Rouse regime was noticed that other than suggested by simulation is not related to a general increase of the Rouse friction – the local dynamics at short times was found to be largely unchanged.