Seminar

“IRTG: Soft Matter Science “

Kinetics and dynamic properties of cylindric micelles at equilibrium and under shear flow

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“Hörsaal Makromolekulare Chemie”,
Stefan-Meier-Str. 31, Freiburg

You are welcome to meet Hong Xu after the seminar. Do not hesitate to contact Christelle Vergnat (softmattergraduate@physik.uni-freiburg.de) to organize a meeting.

Kinetics and dynamic properties of cylindric micelles at equilibrium and under shear flow

The dynamics and rheology of semi-dilute unentangled micellar solutions are investigated
by Langevin dynamics mesoscopic simulations coupled to a microreversible kinetic model for scissions and recombinations. Two equilibrium state points, differing by the scission energy and therefore by the corresponding average micelle length, have been examined. The kinetic rates are tuned by an independent parameter of the model, whose range is chosen in such a way that the kinetics always strongly couple to the chain dynamics.

Our results confirm, as predicted by Faivre and Gardissat, that the stress relaxation, as well as the monomer diffusion, is characterized by a time t_L, defined by the life time
of a segment L, whose Rouse relaxation time is equal to its life time. Moreover, the power law dependence of the zero-shear viscosity versus t_L was evidenced.

Non-equilibrium simulations show that the chain deformation and orientation, as well as the rheology of the system, can be
expressed as universal functions of a single reduced shear rate which is the bare shear rate multiplied by t_L. Furthermore, local analysis of the kinetics under stationary shear gives insights on the variation of the average length with shear rate.