MAR16-2015-000908

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Topology Matters: Structure and dynamics of ring polymers

DIETER RICHTER, JCNS at Forschungszentrum Jlich, 52425 Jlich Germany

In this talk I present recent experimental advances addressing the structure and dynamics of rings. I focus mainly on neutron scattering results that reveal experimental insight on a molecular scale. Structural investigations characterizing rings as compact objects in the melts are put into theoretical context. In contrast to the plateau regime common for all other high molecular weight polymer systems, the dynamic modulus of pure ring systems is characterized by a power law decay, while the viscosity displays a much weaker molecular weight dependence as a corresponding linear melt. The dynamics of ring melts is uniquely addressed by neutron spin-echo spectroscopy. The sub-diffusive center of mass motion at short times agrees well with simulation as well as theoretical concepts. In the internal dynamics the basic length scale of the ring molecule, the loop size, manifests itself clearly. The experiments reveal strong evidence for loop motions and call for further theoretical work describing them. Finally, small fractions of ring molecules in linear melts turn out to be very sensitive probes in order to scrutinize the dynamics of the host with the potential to reveal fundamental aspects of the dynamics of branched polymer systems. \pardReview Letters 131, 168302 (2014)Review Letters 115, 148302 (2015)Matter 11, DOI: 10.1039/C5SM01994J (2015)