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Strongly non-linear extensional stress in polystyrene melts undergoing large steady rate extensional flows combined with structural characterization by neutron scattering measurements [1]

*Kristoffer Almdal^a, Ole Hassager^b, Kell Mortensen^c, Anders Bach^b,
Henrik Koblitz Rasmussen^d, Wim Pyckhout-Hintzen^e.*

^aDepartment of Nanotechnology, Technical University of Denmark

^bDepartment of Chemical and Biochemical Engineering, Technical University of Denmark

^cDepartment of Basic Sciences and Environment, Faculty of Life Sciences, University of Copenhagen

^d Department of Mechanical Engineering, Technical University of Denmark

^e Jülich Centre for Neutron Science-1 & Institute for Complex Systems, Forschungszentrum Jülich
kral@nanotech.dtu.dk

We use small-angle neutron scattering to measure the molecular stretching in polystyrene melts undergoing steady elongational flow at large stretch rates. The radius of gyration of the central segment of a partly deuterated polystyrene molecule is, in the stretching direction, increasing with the steady stretch rate to a power of about 0.25. This value is about half of the exponent observed for the increase in stress value σ , in agreement with Gaussian behavior. Thus, finite chain extensibility does not seem to play an important role in the strongly non-linear extensional stress behavior exhibited by the linear polystyrene melt. A sketch of the experiments is shown in Figure 1.

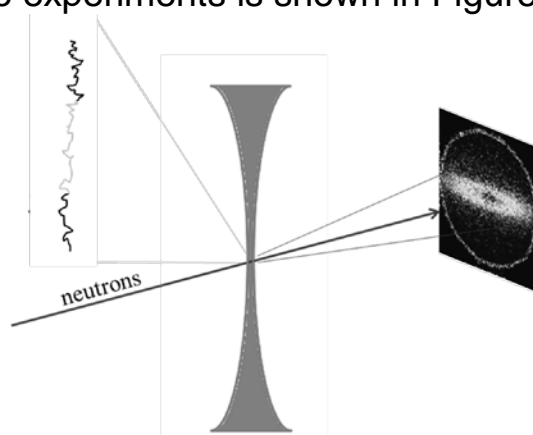


Figure 1. Experimental principle. The polystyrene melts is stretched in a filament stretching rheometer and stresses recorded. Stretched quenched samples are subjected to small-angle neutron scattering characterization.

[1] Ole Hassager, Kell Mortensen, Anders Bach, Kristoffer Almdal, Henrik Koblitz Rasmussen, Wim Pyckhout-Hintzen, *Rheologica Acta*, **2012**, 51, 385-394