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

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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]

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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.

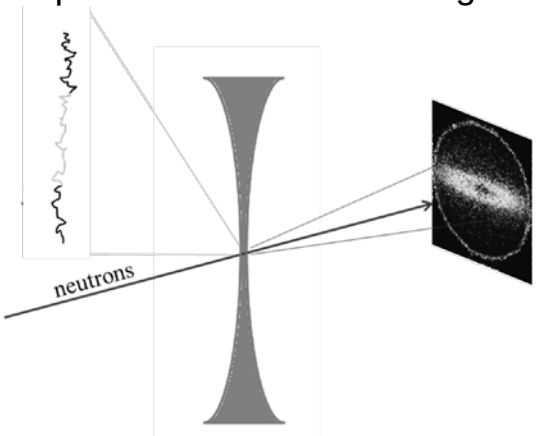

Figure 1. Experimental principle. The polystyrene melts is stretched in a filament stretching rheometer and stresses recorded. Stretched quenched samples are subjected to small-angle neutron scattering characterization.

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