Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Use DNA solutions to model polymer entanglement in flow: simultaneous rheometric and particle-tracking velocimetric measurements
POUYAN BOUKANY, SHI-QING WANG, Department of Polymer Science, University of Akron — Entangled aqueous DNA solutions are ideal as a model system to examine nonlinear flow features including stress overshoot in startup shear and shear thinning phenomenon. These soft systems can be strongly entangled with 60 entanglement points per chain and a terminal relaxation time as long as 1000 s at 1 % concentration [1-2]. They allow a comparison between the steady state attained with a startup shear and that attained through an "infinitely" slow ramping up of the applied shear rate. Indeed, startup shear in the nonlinear (stress plateau) region causes the DNA solutions to yield inhomogeneously, resulting in permanent shear banding. However, the slowly ramped-up shear into the same final rate as applied in startup shear allowed the solutions to avoid shear inhomogeneity. Thus, we demonstrated that it is possible for the final steady states to be different depending on how an entangled system is brought into the same final experimental condition. This result implies that it is ill-defined to pursue conventional constitutive relationship in flow of entangled polymers.
[1] Boukany, P. E.; Hu, T. H.; Wang, S. Q. textitMacromolecules 2007, under review.
[2] Boukany, P. E.; Wang, S. Q. *J. Rheol.* 2007, under review.

Pouyan Boukany
Department of Polymer Science, University of Akron

Date submitted: 26 Nov 2007 Electronic form version 1.4