Abstract Submitted
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How do entangled polymeric liquids flow? SHAM SUNDAR RAVINDRANATH, SHI-QING WANG, University of Akron — This work focused on investigating fundamental questions in polymer dynamics such as how entangled polymeric liquids respond to fast external deformation. By developing an effective particle tracking velocimetric (PTV) method, along with conventional rheometric measurements, new insights can be gained into the phenomenology of entangled polymers in presence of startup shear, step strain and large amplitude oscillatory shear (LAOS). During startup shear of well entangled systems, the shear field becomes inhomogeneous after the stress overshoot for a range of applied shear rates beyond the Newtonian region [1]. The emergence of shear banding after stress overshoot helped us to identify the stress overshoot as indicating yielding, whose characteristics obey some scaling laws. In step shear, contrary to the conventional perception that entangled polymers would undergo quiescent relaxation, the PTV observations reveal macroscopic motions after shear cessation [2]. The recoil-like macroscopic motions appears to reflect an elastic breakdown of the entanglement network due to sufficient build-up of retractive forces. LAOS experiments also demonstrate that entangled polymers cannot sustain a high magnitude of fast deformation without undergoing cohesive failure [3]. [1] *Macromolecules* **2008**, 41, 2663 [2] *Macromolecules* **2007**, 40, 8031 [3] *J. Rheol.* **2008**, 52, 341.

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