Abstract Submitted
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Barrier to chain retraction: where we are six years after the first report of shear inhomogeneity in entangled polymers?[1] SHI-QING WANG, POUYAN BOUKANY, YANGYANG WANG, SHIWANG CHENG, Polymer Science, University of Akron — At APS2006, we reported the first PTV observations of macroscopic motions after shear cessation from step strain on an entangled polybutadiene solution (Macromolecules **2007**, 40, 8031). Since then we have shown that the classical polystyrene solutions display similar non-quiescent relaxation, invalidating the agreement between the data based on PS solutions and the Doi-Edwards damping function. Based on polymer melts we found that this network breakup phenomenon also occurs after a step strain produced with a rate that according to the tube model is too low to generate chain stretching (Macromolecules **2009**, 42, 6261). Does the current tube model possess the necessary ingredients to depict these findings? Here we present new experimental data that further supports the concept of a finite cohesion level for the entanglement network: There is a finite confining force that keeps chains engaged in the network, ensures the structural integrity and allows linear response behavior to take place. In contrast, the tube model perceives barrier-free chain retraction on the Rouse time for any amount of imposed strain, which would necessarily lead to destruction of the original network. Our experiments show that this does not appear to be the case.

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