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Exploring origins of nonlinearity in large amplitude oscillatory shear of different viscoelastic materials XIN LI, The Univeristy of Akron, XIAORONG WANG, Bridgestone Americas Center for Research and Technology, SHI-QING WANG, The University of Akron — The present work studies nonlinear behavior in large amplitude oscillatory shear (LAOS) of three different polymeric materials using both rheometric and particle-tracking velocimetric measurements. We show that nonlinearity in LAOS is often not inherent response of the polymers that are capable of rearranging their microstructures over time. For instance, a highly viscoelastic material made of nano-sized polybutadiene particles exhibits homogeneous deformation and a nearly perfect single-harmonic sinusoidal wave in its stress response despite strong strain softening. In a second example of a well entangled polymer solution, the structural alternation in LAOS occurs non-homogeneously, where the nonlinearity also took a finite time to develop to its fullest. In the last example of wall slip, contrary to the literature claim that it should violate the mirror symmetry, the stress response only involves odd-harmonics, i.e., there is equivalence during steady-state wall slip in LAOS when the direction of shear is reversed.

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