Abstract Submitted
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Non-affine velocity fields to explain weakly-nonlinear rheology NABIL RAMLAWI, University of Illinois at Urbana Champaign, ASHWIN N. BHARADWAJ, Nike, Inc., RANDY H. EWOLDT, University of Illinois at Urbana Champaign — We derive and interpret the weakly nonlinear response of the Johnson-Segalman/Gordon-Schowalter constitutive model for non-Newtonian fluids. Non-affine "slip" velocity fields cause the nonlinearity in this family of models. From our theoretical derivation, we show how quantitative medium-amplitude oscillatory shear (MAOS) nonlinearities can be associated with these material-level flow physics. Other constitutive models are a subset of the generalized results presented here, including the generalized Corotational Maxwell model. We derive results for a generalized relaxation kernel allowing for complex relaxation spectra, enabling us to reinterpret previously published MAOS experimental data in terms of non-affine flow and deformation. Reference: Ramlawi, N., N. A. Bharadwaj, and R. H. Ewoldt, "The weakly nonlinear response and non-affine interpretation of the Johnson-Segalman/Gordon-Schowalter model," arXiv:2007.08089 [cond-mat.soft], https://arxiv.org/abs/2007.08089

Nabil Ramlawi
University of Illinois at Urbana Champaign

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