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Apparent viscosity during unyielding of a thixotropic yield stress fluid[1] YURIKO RENARDY, Dept of Mathematics, 460 McBryde Hall, Virginia Tech, Blacksburg, VA 24061-0123, KARA MAKI, School of Mathematical Sciences, Rochester Institute of Technology, Rochester, NY 14623 — We present a mathematical interpretation of a thixotropic yield stress fluid, based on a viscoelastic constitutive law in the limit of large relaxation time, together with a Newtonian solvent. The dynamics is initiated by a step-up or step-down in prescribed shear stress. There is no presumption of a yield stress, but nevertheless, we obtain yield stress behavior. The thixotropic behavior of the model arises from the multiple time scales which emerge in the limit of large relaxation time. These give rise to fast dynamics (elastic deformation) and slow dynamics (unyielding), in addition to yielded dynamics for shear flow. We present how the model predicts the evolution of apparent viscosity during unyielding.

Yuriko Renardy
Dept of Mathematics, Virginia Tech, Blacksburg, VA 24061-0123

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