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Melt extending polyisoprene to develop new understanding of nonlinear polymer rheology[1] JIANNING LIU, YI FENG, Department of Polymer Science, University of Akron, MISICHRONIS KOSTAS, Department of Chemistry, University of Tennessee, Knoxville, Tennessee 37996, APOSTOLOS AVGEROPOULOS, Department of Materials Science Engineering University of Ioannina University Campus , SHI-QING WANG, Department of Polymer Science, University of Akron — This study investigates all aspects of nonlinear rheological responses of linear polyisoprene melts in uniaxial extension. On one hand, we demonstrate a) the failure of the conventional theory to explain the difference in the responses to startup extension between entangled melts and entangled solutions (made of high and low molecular weights) and b) the need to treat entangled polymers as an explicit network. On the other hand, we investigate whether and how the transition from yielding and extensional softening to true strain hardening and melt rupture takes place in weakly entangled polyisoprene and whether a breakdown of time-temperature superposition occurs, as it did in styrene butadiene rubbers.

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