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Origin of mechanical stress from tensile extension of polymer glasses PANPAN LIN, SHI-QING WANG, Maurice Morton Institute of Polymer Science and Engineering, University of Akron — During uniaxial extension, polymer glasses undergo elastic deformation, yielding, strain softening, neck propagation, and "strain hardening". Both plasticity and anelasticity emerge under the large deformation, making the origin of the mechanic stress elusive to identify. The present work employs an IR camera to make *in situ* temperature measurements on the extending specimen along with the conventional force measurements. To demonstrate the generality of our findings we studied the ductile polycarbonate as well as two brittle polymers, i.e., PS and PMMA, which can be made ductile by melt extension [1]. We found that the rate of heat generation is only a small fraction of the mechanical power involved in the uniaxial extension of these polymer glasses. Thus, it seems that the origin of the tensile stress is largely intrachain, stemming from straining of the chain network.

[1] Zartman, G. D.; Cheng, S. W.; Li, X.; Lin, F.; Becker, M. L.; Wang, S. Q. *Macromolecules* **2012**, *45*, 6719-6732.

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