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Stress relaxation behavior of polymer glasses in uniaxial extension PANPAN LIN, SHIWANG CHENG, JIANNING LIU, SHI-QING WANG, Univ of Akron — Ductile polymers can undergo large tensile extension upon mechanical precondition (i.e. milling and melt-stretching). In the post-yield regime the tensile stress can still grow with the extension partially because of the elastic energy buildup as the chain tension grows from the stretching of the chain network [1]. To learn more about the nature of the mechanical stress, we carried out a series of stress relaxation experiments of both milled and melt-stretched PC. We found rescaling behavior, i.e., the stress relaxation is faster from a faster tensile extension by exactly the same amount. In other words, for an extension made at a cross-head speed of V_1, the stress relaxation occurs on a time scale of t_1. Then the stress relaxation from an extension produced at $V_2 > V_1$ occurs on a time scale of $t_1(V_1/V_2)$. This is true for a range of nearly five orders of magnitude in V. We have studied this surprising scaling law as a function of the precondition.

[1] "Strain hardening in homogeneous deformation of polymer glasses," P. P. Lin *et al.*, Phys. Rev. Lett., under review.

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