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Can intrachain contributions dominate the stress response of polymer glasses under large deformation?

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Polymer glasses are a structural hybrid in their mechanical responses to large deformation. The primary structure due to the short-range inter-segmental van der Waals bonds yields at small strains. In presence of chain connectivity, brittle failure may be avoided if the chain networking is adequately dense. We show in this presentation how the interplay between the primary structure and chain network dictates deformation, yielding, strain softening, strain localization and "strain hardening" during continuous uniaxial extension at room temperature of a variety of polymer glasses from the brittle (e.g., PS, PMMA) to the ductile (e.g., PC). In particular, our results identify straining of the chain network as the dominant contribution to the mechanical stress in the post-yield regimes.