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Observation of yield in a triaxial deformation of a glassy thermoset polymer GRIGORI MEDVEDEV, JAE-WOO KIM, JAMES CARUTHERS, Purdue University — Yield and post-yield behavior of amorphous polymers in a glassy state have been extensively studied in uniaxial tension and compression. In such geometry, the volume change is relatively small reaching the maximum value of approximately 0.5% at the yield point. To study the role of the volumetric contribution a different geometry is needed. Here we report on the first observation of yield behavior in the longitudinal deformation, where the volume change is an order of magnitude higher than in the uniaxial test. The experiment is performed sufficiently close to T_g to ensure that yielding occurs before brittle failure. To characterize the evolution of the mobility/relaxation rate induced by deforming the glassy material through yield, a series of stress relaxation experiments are carried out at various pre-yield and post-yield strains. These experiments are done in uniaxial tension, compression and, for the first time in a longitudinal deformation. Implications of the observation of yield in a dilatation dominated deformation in addition to the traditional uniaxial and shear yield for the theories of glassy behavior and the development of constitutive models are discussed.

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