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The role of uniaxial deformation on microstructure and dynamics of a bulk-polymerized polyurea¹ JAMES RUNT, TAEYI CHOI, The Pennsylvania State University, DANIEL FRAGIADAKIS, C. MICHAEL ROLAND, Naval Research Laboratory — Polyureas, formed by the rapid reaction between isocyanates and diamines are attractive for various applications due to their outstanding mechanical properties, which can be tuned by varying component chemistry, molecular weight and stoichiometry. Polyureas synthesized from a modified methylene diphenyl diisocyanate (Isonate 143L) and polytetramethylene oxide-di-p-aminobenzoate (Versalink P1000) are widely utilized and investigated for energy absorbing applications such as impact mitigation and ballistic protection. In order to develop a more complete understanding of their mechanical response, we explore the effect of uniaxial strain on the phase separated microstructure and molecular dynamics. We utilize wide- and small-angle X-ray scattering to investigate amorphous segment and hard domain orientation and broadband dielectric spectroscopy for interrogation of the dynamics. Uniaxial deformation was found to significantly perturb the phase separated microstructure and chain orientation, and result in a considerable slowing down and broadening of the polyurea soft phase segmental relaxation.

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