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X-ray scattering investigation of structural relaxation in an ordered block copolymer melt subjected to uniaxial extensional flow WESLEY BURGHARDT, ERICA MCCREADY, Northwestern University — The structural dynamics of an ordered styrene-ethylene butylene-styrened triblock copolymer have been studied in uniaxial extensional flow using in situ x-ray scattering. Experiments were performed in a custom instrument consisting of an SER extensional flow fixture housed in a convection oven designed to facilitate x-ray access. Use of synchrotron radiation provided sufficient time resolution to study the structural response during inception of uniaxial flow, and as a function of time following flow cessation. The sample studied here exhibits hexagonally packed cylindrical microdomains of polystyrene embedded in a poly(ethylene butylene) matrix. Application of extensional flow produces multiple structural effects, including deformation of the microphase-separated morphology, and a complex reorientation process in which elongated PS microdomains progressively orient along the stretching axis. A series of experiments was run in which samples were stretching to varying Hencky strains, allowing investigation of the nature of structural relaxation from a variety of flow-induced structural states induced during extensional flow. Significant differences in structural relaxation are found depending on the total applied extensional strain.

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