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Dynamics of Main Chain Liquid Crystal Elastomers by X-ray Scattering[1] DENA M. AGRA-KOOIJMAN, LEELA JOSHI, SONAL DEY, SATYENDRA KUMAR, Kent State University, WANTING REN, WHITNEY KLINE, ANSELM C. GRIFFIN, Georgia Institute of Technology — Main chain liquid crystal elastomers (MCLCEs) are crosslinked polymer networks that incorporate liquid crystal mesogens into the backbone and combine anisotropic order of liquid crystals and elastic properties of polymers. We investigated the structural response and relaxation dynamics of several siloxane-based smectic-C MCLCEs upon the application of strain, after removal of strain, and with temperature. These elastomers relaxed under constant strain as evident from the changes in the smectic-C tilt angle. At low strains, the MCLCEs exhibited reversible elastic behavior but had anelastic response beyond a threshold strain of ∼50%. The MCLCE films' structure gradually changed with increasing strain at room temperature and revealed a strain dependent enhancement of the smectic order. At strains beyond 50%, a monodomain structure from an initially polydomain state was obtained. Quantitative analysis of the structural evolution with strain, time, and temperature provide important insight into their molecular level relaxation.

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