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Thermal Characterization of Thermotropic Nematic Liquid-Crystalline Elastomers DAVID THOMAS, MATT CARDARELLI, Tufts University, ANTONI SANCHEZ-FERRER, ETH Zurich, BADEL L. MBANGA, TIMOTHY J. ATHERTON, PEGGY CEBE, Tufts University — Nematic Liquid-Crystallline Elastomers (LCEs) are weakly crosslinked polymeric networks that exhibit rubber elasticity and liquid-crystalline orientational order due to the presence of mesogenic groups. Three end-on side-chain nematic LCEs were investigated using real-time synchrotron wide-angle X-ray scattering (WAXS), differential scanning calorimetry (DSC), and thermogravimetry (TG) to correlate thermal behavior with structural and chemical differences among them. The elastomers differed in crosslinking density and mesogen composition. Thermally reversible glass transition temperature, T_{g}, and nematic-to-isotropic transition temperature, T_{ni}, were observed upon heating and cooling for all samples. By varying the heating rate, T_{g}^{0} and T_{ni}^{0} were determined at zero heating rate. The temperature dependence of the orientational order parameter was determined from the anisotropic azimuthal angular distribution of the equatorial reflection seen during real-time WAXS experiments. Our results show that the choice of crosslinking unit, its shape, density, as well as the structure of co-monomers, all influence the temperature range over which the thermal transitions take place.

David Thomas
Tufts University

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