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Polydomain Liquid Crystalline Networks as Actuators PATRICK MATHER, HAIHU QIN, Case Western Reserve University, INGRID ROUSSEAU, University of Connecticut — We have separately designed and synthesized rigid nematic networks and compliant smectic-C networks, each existing with polydomain textures at equilibrium and accessible isotropization temperatures. The materials share molecular similarity by use of identical mesogens, but in the nematic case these mesogens are linked directly together by ADMET polymerization, leaving residual unsaturation for crosslinking, while in the smectic-C case the mesogens are bridged by short siloxane spacers that afford the macroscopic compliance. In this presentation we show that despite dramatically different stiffnesses and phase symmetries for these materials, they share in common reversible elongation/contraction on cooling and heating through liquid crystallization/isotropization, respectively. It is argued that this common feature derives from a polydomain-monodomain transition possible in both types of material due to their existence as highly textured materials. We further show that large strain "fixing" is possible in both types of materials, such fixing being possible by vitrification of the entire material in the nematic case or of the mesogen-rich layers only in the smectic case.

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