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Polydomain to monodomain transition in nematic liquid crystal elastomers[1] BADEL MBANGA, FANGFU YE, JONATHAN SELINGER, ROBIN SELINGER, Liquid Crystal Institute / Kent State University — Liquid crystal elastomers are crosslinked polymer networks covalently bonded with liquid crystal mesogens. In the nematic phase, due to strong coupling between mechanical strain and orientational order, these materials display strain-induced instabilities associated with formation and evolution of orientational domains. Deformation of an initially polydomain nematic elastomer film induces a transition to the monodomain configuration. We model this phenomenon using a recently developed finite element elastodynamics simulation method. We study the rate-dependent material response upon uniaxial extension and resolve the textures that form along with the associated stress-strain behavior. Our simulations yield qualitative agreement with experimental observations. This model allows us to explore the fundamental physics governing dynamic mechanical response of nematic elastomers and also provides a potentially useful computational tool for engineering device applications.

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