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**Simulation studies of liquid crystal elastomers: soft elasticity**[1]
BADEL MBANGA, JONATHAN V. SELINGER, ROBIN SELINGER, Kent State University — Liquid crystal elastomers combine the elastic properties of rubbers with the order inherent in nematic liquid crystals. Stretching a monodomain strip of nematic elastomer in a direction transverse to the nematic director results in an energy-free rotation of the director, giving rise to a soft elastic response. In building a simulation model of this mechanism, we consider the limit in which the orientational order equilibrates rapidly compared to the strain, so that the local order tensor remains in continuously evolving quasi- static equilibrium as the strain relaxes. The order tensor in each volume element is determined by minimizing a free energy functional in the form of a Landau expansion that includes a term coupling the local orientational order with the local strain. The strain evolves via nonlinear finite element explicit dynamics. We intend through this model to further our understanding of the basic physics governing the dynamic mechanical response of nematic elastomers and also provide a useful computational tool for design and testing of potential engineering device applications.

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