Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Shape and chirality transitions in twisted nematic elastomer ribbons: Finite element simulation studies VIANNEY GIMENEZ-PINTO, Liquid Crystal Institute, Kent State University, FANGFU YE, University of Illinois, Urbana, BADEL MBANGA, University of Massachusetts, Amherst, JONATHAN SELINGER, ROBIN SELINGER, Liquid Crystal Institute, Kent State University — We use finite element simulation studies to explore transitions of shape and chirality in nematic elastomer ribbons with a twisted director configuration. Recent experimental and theoretical studies demonstrated that these fascinating materials show reversal of macroscopic chiral sense under a change of temperature, and explored shape selection as a function of the sample's aspect ratio. We explore these phenomena via three dimensional finite element simulation studies. For ribbons with width/thickness ratio above a threshold value, we find that on heating the sample undergoes a sequence of shape transitions from right handed helix – right handed twisted ribbon – flat ribbon – left handed twisted ribbon – left handed helix. Ribbons with width/thickness ratio below the threshold show fewer shape transitions, from right handed twisted ribbon – flat ribbon – left handed twisted ribbon. These results are in qualitative agreement with theoretical predictions, provide insight into experimental observations, and demonstrate the value of finite element methods for future engineering design of nematic elastomer devices.

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Date submitted: 10 Nov 2011 Electronic form version 1.4