Abstract Submitted
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Engineering out-of-plane actuation in thin-film polymer networks: an auto-origami box[1] FANGFU YE, Institute of Physics, Chinese Academy of Sciences, VIANNEY GIMENEZ-PINTO, Columbia University, ROBIN SELINGER, Kent State University — Liquid crystal polymer networks can be programmed to display complex stimuli-responsive shape transformations given a particular non-uniform director microstructure. Inspired by the variety of morphing shapes that these materials exhibit, we implement finite element elastodynamics simulations to design and test two nematic director fields that will form an auto-origami box under external stimulus. This thin-film actuator is flat at a reference state and spontaneously folds with changes in nematic order. The first proposed director microstructure is based on arraying four twist-nematic domains, while the second implements a hybrid radial-azimuthal director with +1 topological charge to induce four-fold symmetry bending. These studies provide an insight on experimental observations of elastomers with similar nematic microstructures and show the value of finite element elastodynamics simulations for engineering liquid crystal polymeric devices.

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