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Mechanisms of Photo-Induced Deformations of Liquid Crystal Elastomers NATHAN DAWSON, MARK KUZYK, Washington State University, JEREMY NEAL, PAUL LUCHETTE, PETER PALFFY-MUHORAY, Kent State University, NONLINEAR OPTICS GROUP: WASHINGTON STATE UNIVERSITY TEAM, LIQUID CRYSTAL INSTITUTE: KENT STATE UNIVERSITY COLLABORATION — Over a century ago, Alexander Graham Bell invented the photophone, which he used to transmit mechanical information on a beam of light. We report on the use of an active Fabry-Perot interferometer to encode and detect mechanical information using the photomechanical effect of a liquid crystal elastomer (LCE) that is placed at a critical point between the reflectors. These are the first steps in the creation of ultra smart materials which require a large photomechanical response. Thus, understanding the underlying mechanisms is critical. Only limited studies of the mechanisms of the photomechanical effect, such as photo-isomerization, photo-reorientation and thermal effects have been studied in azo-dye-doped LCEs and in azo-dye-doped polymer fibers have been reported. The focus of our present work is to use the Fabry-Perot transducer geometry to study the underlying mechanisms and to determine the relevant material parameters that are used to develop theoretical models of the response. We use various intensity-modulated optical wave forms to determine the frequency response of the material, which are used to predict the material response.

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