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Photo-Induced Deformations of Liquid Crystal Elastomers[1]
NATHAN DAWSON, MARK KUZYK, Washington State University, JEREMY NEAL, PAUL LUCHETTE, PETER PALFFY-MUHORAY, Kent State University
— Over a century ago, Alexander Graham Bell transmitted mechanical information on a beam of light using the "photophone." We report on the use of a Fabry-Perot interferometer to encode and detect mechanical information of an illuminated liquid crystal elastomer (LCE) that is placed at a critical point between the reflectors. Furthermore, we show that cascading of macroscopic LCE-interferometer devices is possible. These are the first steps in the creation of ultra smart materials. Such applications require materials with a large photomechanical response. Thus, understanding the underlying mechanisms is critical. Only limited studies of the mechanisms of photomechanical effects have been studied in azo-dye-doped LCEs. 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 in the time domain.

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Nathan Dawson
Washington State University

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