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Mechanics of Polymer Networks Subjected to Photochemically-Induced Rearrangement KEVIN LONG, TIMOTHY SCOTT, JERRY QI, MARTIN DUNN, Mechanical Engineering Department, University of Colorado, Boulder — Mechanically responsive, light-activated polymers exhibit complex mechanical behavior in response to light. Recently, several new systems have been developed with unique underlying photomechanical mechanisms. For example, radical-mediated network cleavage, reformation, and consequent rearrangement locally alleviates the macroscopic stress in the material studied here. The state of the art in these systems is confined to simple experiments and demonstrations, and therefore, their use in the scientific and engineering communities is impeded by the lack of theoretical and computational tools to predict their behaviors. We present our efforts to characterize, model, and simulate the continuum-scale photo-mechanical behavior of the network rearranging material. An overview of our multi-physics constitutive model is presented along with companion characterization experiments used in its calibration. A variety of applications are both experimentally and theoretically investigated, and future directions and challenges are presented.

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