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Modeling Photo-Reconfiguration and Directed Motion of Spirobenzopyran- Containing Polymer Gels OLGA KUKSENOK, ANNA C. BALAZS, University of Pittsburgh — We develop a computational model to simulate the behavior of photo-responsive polymer gels that contain spirobenzopyran (SP) chromophores. Using this model, we design three-dimensional samples with dynamically reconfigurable morphologies and photo-induced motility. In the dark, the SP moieties assume an open ring conformation and are hydrophilic; under illumination with blue light, the chromophores assume a closed ring conformation and are hydrophobic. This collapse of the gels is caused by the decrease in hydration due to conformational changes and not by a light-induced heating of the polymer network. We demonstrate that these gels can be effectively patterned remotely and reversibly with light by illuminating the sample through photomasks. We also show that by introducing variations in crosslink density within the gels during their preparation, as well as introducing temperature gradients, we have additional means of guiding the dynamic behavior of these versatile, responsive systems. Furthermore, we demonstrate that one can use a mobile light source to move multiple gel pieces to a specific location. The results point to a novel method for controlling the self-organization of soft, reconfigurable materials.

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