MAR08-2007-020066

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

## Elastomeric Photopolymers: Shaping Polymer Gels with Light

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Polymer gels that possess a latent ability to change shape, which can be triggered in a spatially resolved manner using light—"elastomeric photopolymers"—have been developed to meet the need for materials that can be reshaped without direct contact, e.g., to non-invasively adjust an implanted lens in the human eye. The physics of diffusion and swelling in elastomers are applied to create a transparent silicone suitable for making a foldable intraocular lens that can be reshaped using near ultraviolet light. A crosslinked silicone matrix dictates the initial shape of the lens, while "macromers"–short silicone chains with polymerizable end groupsand photoinitiator enable shape adjustment using light: polymerization of the macromer in the irradiated regions, followed by diffusion of free macromer causes local swelling. To predict shape change directly from irradiation profile, a theoretical treatment is presented that captures 1. shape change with no external forces, 2. coupling between diffusion and deformation, and 3. connection between thermodynamics, constitutive equations and equations of motion. Using continuum mechanics complemented with thermodynamics within the auspices of the finite element method, we develop a steady-state model which successfully captures the coupling between diffusion and deformation. Parameter values are drawn from our prior experimental studies of the mechanical properties, equilibrium swelling, penetrant diffusivities and interaction parameters in systematically varied polydimethylsiloxane (PDMS) networks and acrylate endcapped PDMS macromers. Preliminary computational studies show qualitative agreement with experimentally observed phenomena.