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Holographic Patterning and Crystallization of a Semicrystalline polymer MICHAEL BIRNKRANT, Drexel University, CHRISTOPHER LI, Drexel University, LALGUDI NATARAJAN, VINCENT TONDIGLIA, RICHARD SUTHERLAND, Science Applications Intl Corp, TIMOTHY BUNNING, Air Force Research Laboratory — Manufacturing dynamically controlled multifunctional photonic structures for application in optical elements and waveguides is crucial to control the flow of light. Holographic Patterning (HP) is a simple, fast and attractive means to fabricate complex photonic structures. During the HP process, a photopolymerizable syrup is exposed to two or more coherent laser beams. The resulting anisotropic photopolymerization leads to the spatial distribution of a crosslinked network polymer and homopolymer poly ethylene glycol (PEG). The HP of low molecular weight PEG and thiol-ene reactive monomers produced a long range uniform layered structure. The difference in refractive indexes of PEG and crosslinked polymer network results in unique transmission spectra and diffraction efficiencies. Furthermore, upon heating the holographically patterned PEG produces a red shift in the reflected wavelength of the material which reverses upon cooling. Closer analysis through X-ray scattering has found that PEG crystals contained within the confined layers preferentially crystallize.

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