Supporting Information

Unconventional Shape Memory Mechanisms of Nanoporous Polymer Photonic Crystals: Implications for Nanooptical Coatings and Devices

Yongliang Ni,[†] Yifan Zhang,[†] Sin-Yen Leo,[‡] Yin Fang,[‡] Mingzhen Zhao,[§] Long Yu,[§] Kyle D. Schulze,[†] Wallace G. Sawyer,[†] Thomas E. Angelini,[†] Peng Jiang[,‡], and Curtis R. Taylor[*,†]*

[†]Department of Mechanical and Aerospace Engineering, University of Florida, Gainesville, Florida 32611,

[‡]Department of Chemical Engineering, University of Florida, Gainesville, Florida 32611,

[§]Department of Material Science and Engineering, University of Florida, Gainesville, Florida 32611.

[*] Corresponding author. E-mail: pjiang@che.ufl.edu, curtis.taylor@ufl.edu

The elastic moduli as a function of polymer compositions were measured by micro-indentation. The effective elastic modulus was calculated by fitting the experimental curve with the Johnson-Kendall-Robert (JKR) contact mechanics model considering a large pull-off force (adhesion) observed in detachment. The contact force, P, is related to the contact radius, a, by following the expression:

$$a^3 = \frac{3R}{4E_{eff}}\left(F + 3\gamma\pi R + \sqrt{6\gamma\pi RP + (3\gamma\pi R)^2}\right) \qquad (S1)$$

where γ is the surface energy and R is the tip radius. The contact depth, δ, is related to the contact radius, a, by:[39]
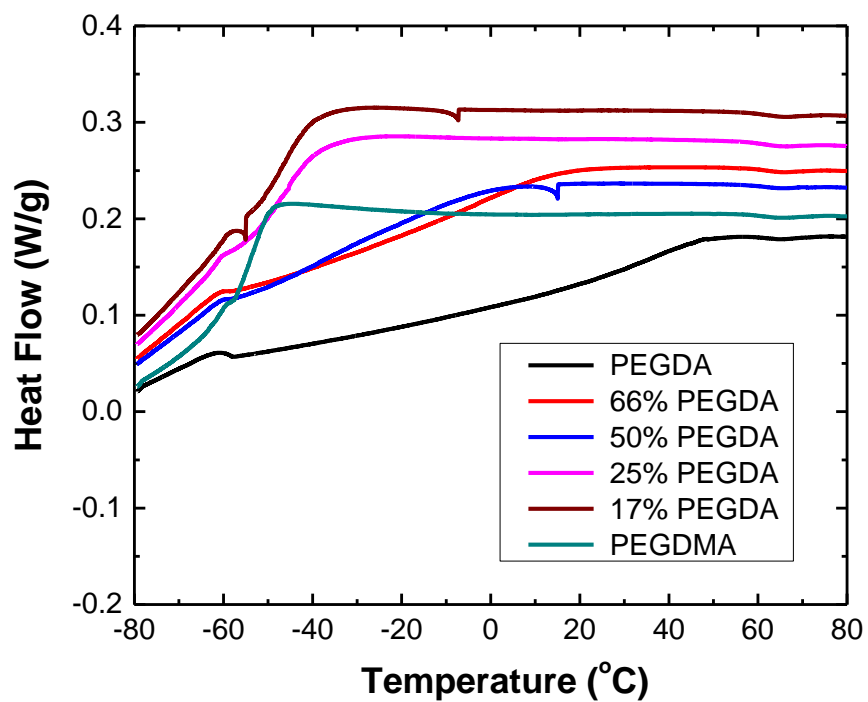
$$\delta = \frac{a^2}{R} - (\frac{2\pi\gamma R}{E_{eff}})^{1/2} \qquad (S2)$$

Table S1. Summary of glass transition temperatures of pure PEGDA and PEGDMA polymers and their copolymers with different PEGDA contents.
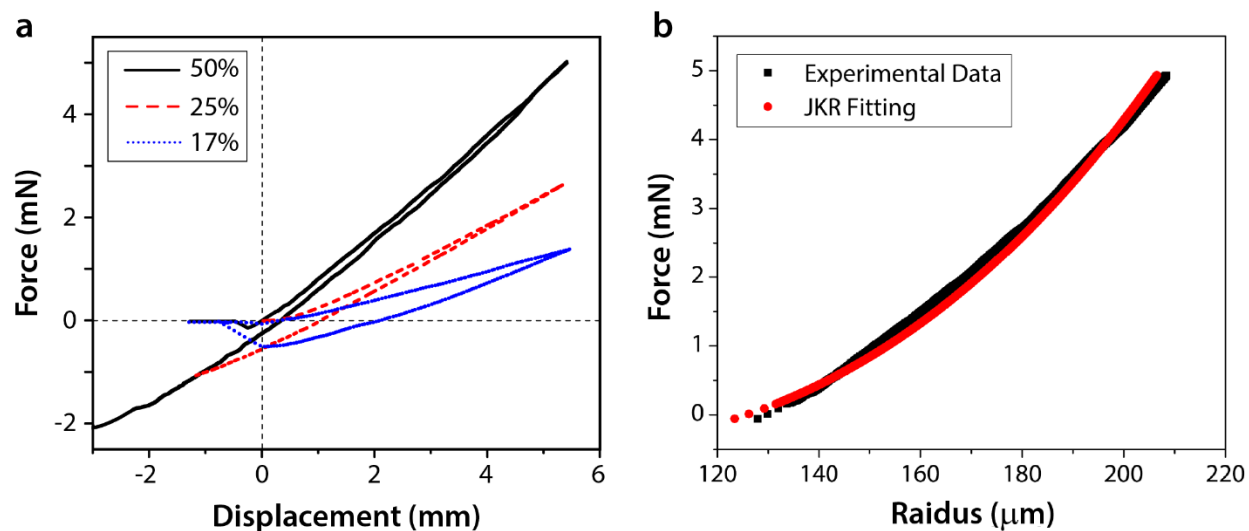
| Polymer Composition	T_g (°C)
PEGDA	-5
67% PEGDA	-21
50% PEGDA	-28
25% PEGDA	-47
17% PEGDA	-47
PEGDMA	-53
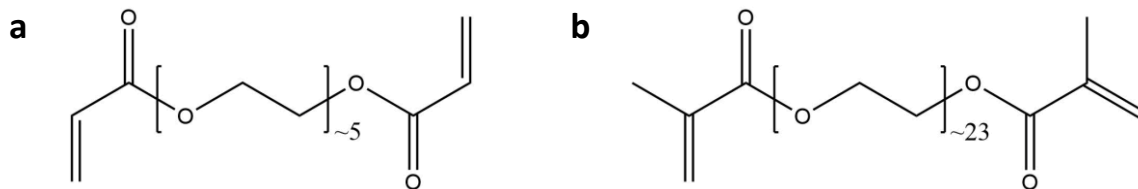
Figure S1. Molecular structures of a) PEGDA (MW ~ 200 g/mol) and b) PEGDMA (MW ~ 1000 g/mol) oligomers.

Figure S2. Typical DSC plots of pure PEGDA and PEGDMA polymers and their copolymers with different PEGDA contents.

Figure S3. a) Typical indentation force-displacement curves of the indentation on PSMPCs comprising 50%, 25%, and 17% PEGDA. b) JKR model fits well on the loading portion of the indentation curve of the PSMPC containing 50% PEGDA.
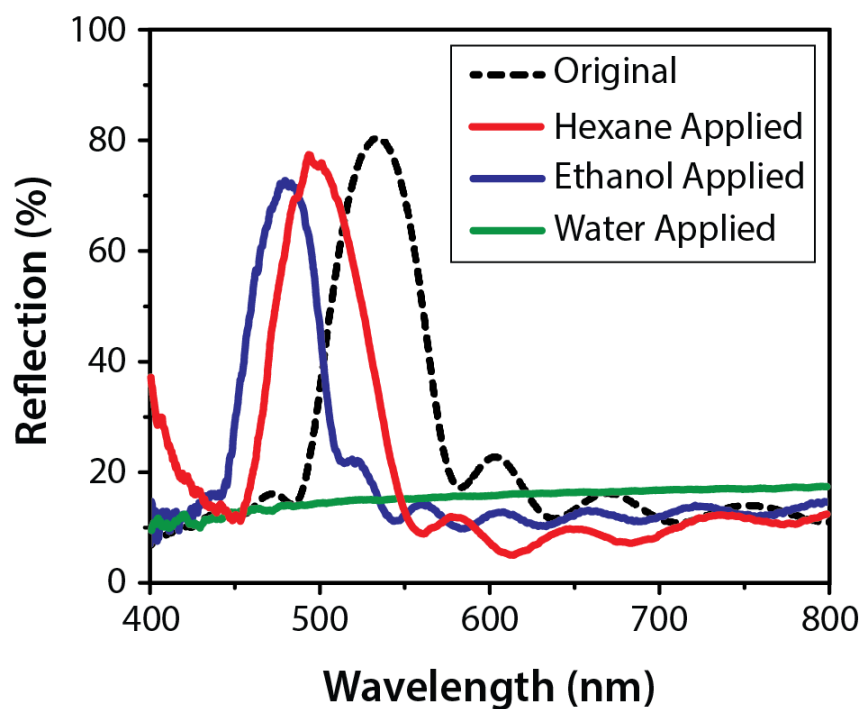
Figure S4. Normal-incidence optical reflection spectra obtained from a pure PEGDA PSMPC (labeled as Original) and a PSMPC comprising 33% PEGDA dried out from liquid hexane, ethanol, and water, respectively.