Supplementary Information

Drilling by light: ice-templated photo patterning toward a dynamically crosslinked hydrogel

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Supporting Videos

Movie S1: The full process of ice-templated photo patterning.

Movie S2: Development of porous pattern via ice-melting.

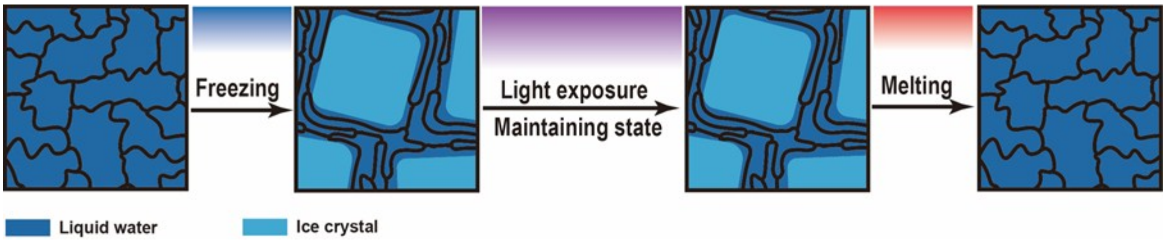

Figure S1. Network change of the non-dynamic gel when subjected to the freezing, light exposure, and ice-melting. The process is identical to Figure 1a. However, the network topology does not rearrange during the light exposure due to the absence of dynamic crosslinker. As a result, upon ice-melting, polymer network chains return to their original states and no pores are not formed.

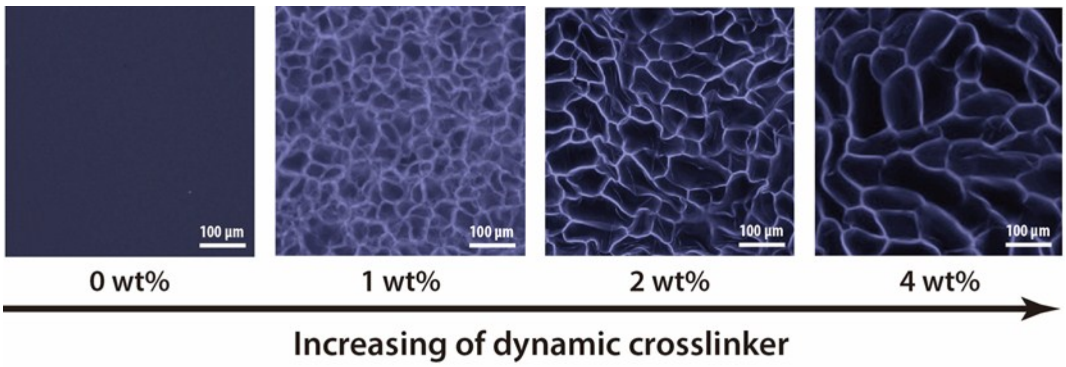

Figure S2. The impact of the dynamic crosslinker concentration. Hydrogel with 0 wt% of dynamic crosslinker was synthesized using the non-dynamic crosslinker. The dynamic hydrogel with 4 wt% of dynamic crosslinker was chosen for further study it had the optimal mechanical properties. Dynamic hydrogels with lower concentration of crosslinkers are too soft to handle and those with higher concentration are too brittle.

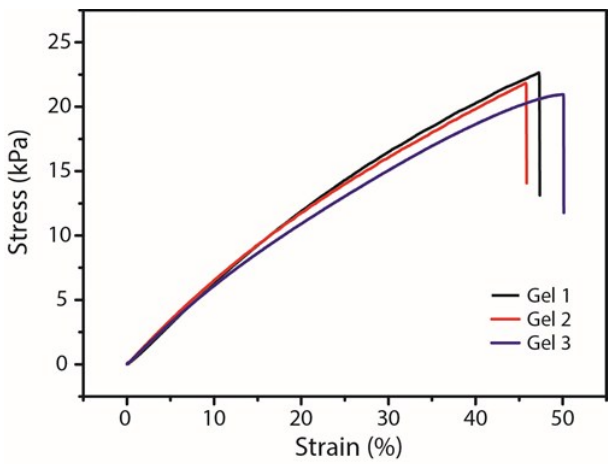

Figure S3. Stress-strain curves of three parallel samples of the dynamic gel with 4 wt% disulfide crosslinker.

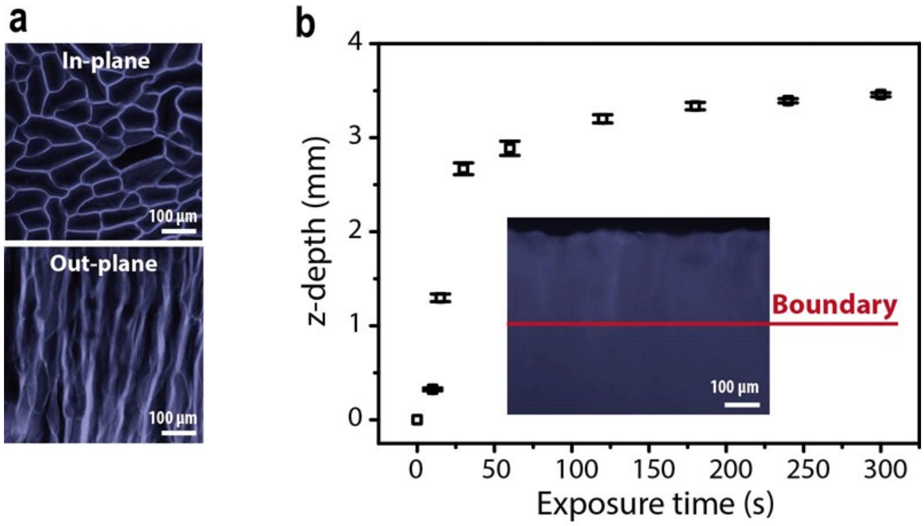

Figure S4. The morphologies of pores formed in dynamic gel with 4wt% dynamic crosslinker. (a) CLSM images of a porous hydrogel in the in-plane and out-plane directions. (b) Impact of light exposure time on the pore development in the depth direction. Insert image shows the boundary between the porous and non-porous regions in the thickness direction.

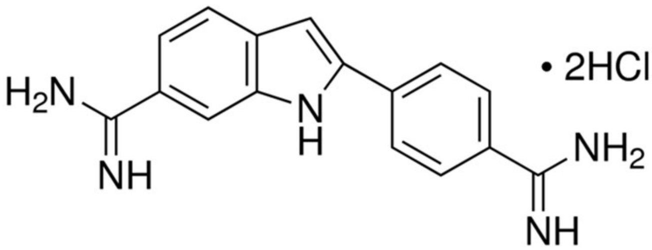

Figure S5. The molecular formula of 4’, 6-diamidino-2-phenylindole dihydrochloride (DAPI dye).

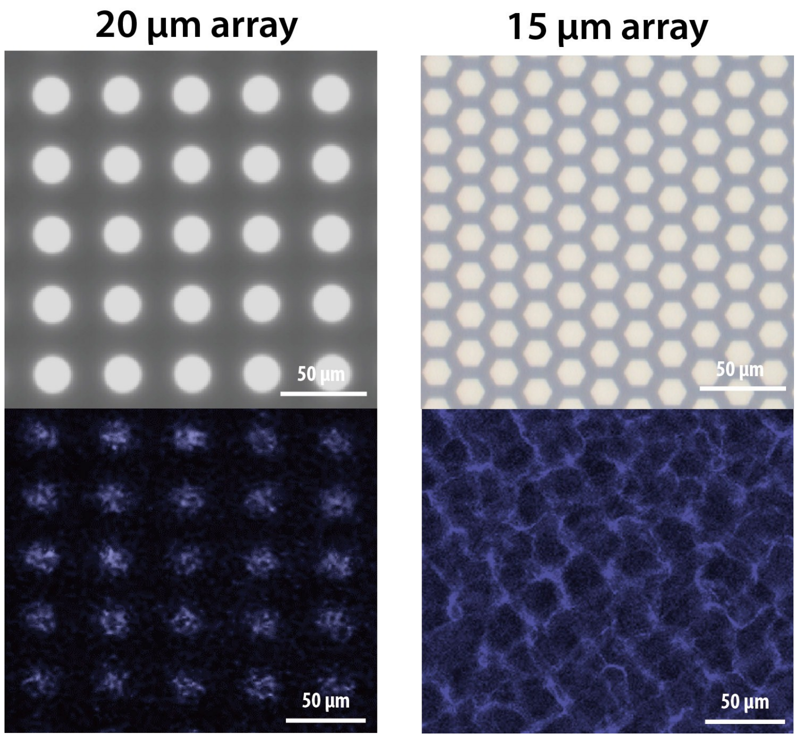

Figure S6. CLSM images of the patterned porous dot array (bottom) and the corresponding photo masks (top). The dynamic hydrogel used contains 2 wt% PVA.

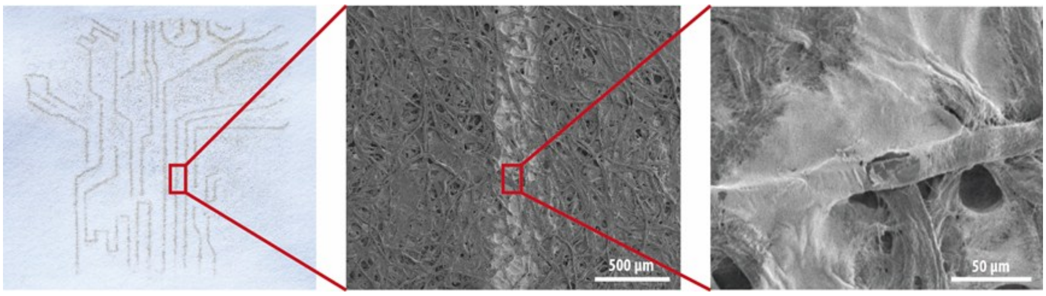

Figure S7. The printed circuit. The bright colored region in the scanning electron microscopic image (right) represents the domain with printed silver nanowires.

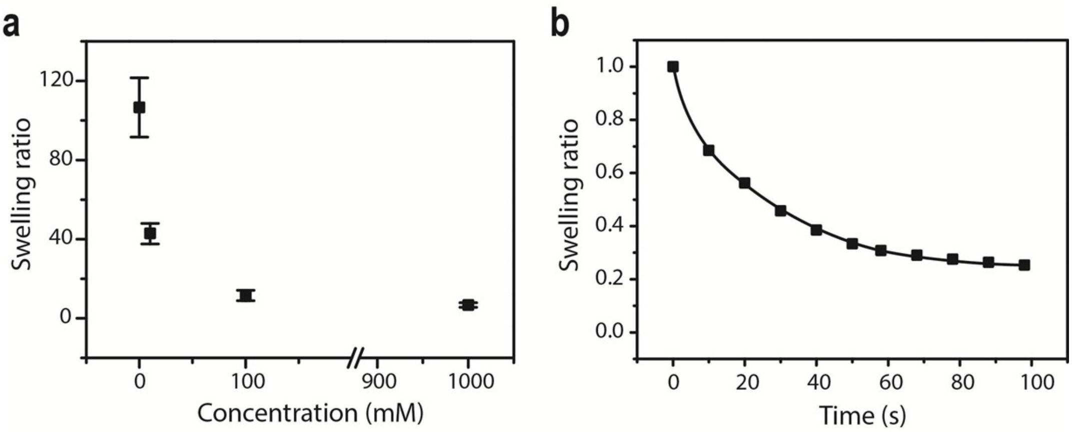

Figure S8. Ionic-strength responsiveness of the dynamic hydrogel. (a) Impact of sodium chloride concentration on the swelling ratio, showing hydrogel shrinking with ionic strength. (b) The kinetics of hydrogel shrinkage (normalized) upon changing the sodium chloride concentration from 0 M to 1 M.