

Supporting Information

Robust Self-Healing Magnetically Induced Colloidal Photonic Crystals Hydrogels

*Su-Na Yin, ^{*a} Juan Liu, ^a Defeng Wu, ^a Su Chen ^{*b} and Weiwei Xia ^c*

School of Chemistry and Chemical Engineering, Yangzhou University, 180
Siwangting Road, Yangzhou, Jiangsu 225002, P. R. China

Corresponding Author

*E-mail: snyin@yzu.edu.cn

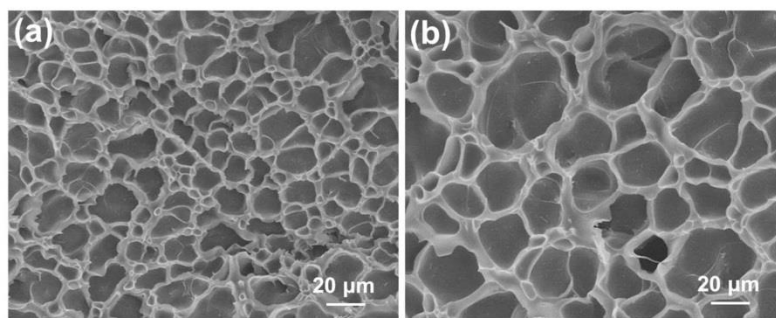


Figure S1. SEM images of O-CMC-modified poly (NVP-co-AAM) hydrogel with microporous structure at different [NVP]/[AAM] ratios of (a) 1:3 and (b) 1:1 (mol/mol).

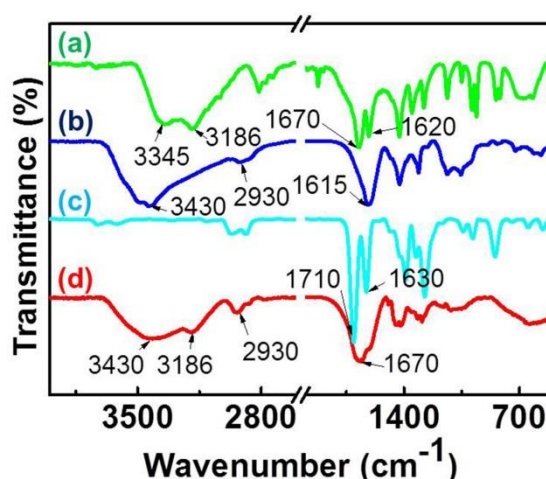


Figure S2. FT-IR spectra of (a) acrylamide (AAM), (b) O-carboxymethyl chitosan (O-CMC), (c) 1-vinyl-2-pyrrolidinone (NVP) and (d) self-healing hydrogel.

In order to fabricate self-healing functional colored hydrogels, we immobilized CPCs structures into O-CMC-modified poly (NVP-co-AAM) polymer. Figure S2a-d showed the FT-IR spectra of pure AAM, pure O-CMC, pure NVP and as-prepared CPCs-loaded hydrogels, respectively. The FT-IR spectrum of pure AAM presented characteristic absorption peaks at 3345 and 3186 cm⁻¹ associated with the asymmetric and symmetric stretching vibration of -NH₂ group, at 1670 cm⁻¹ related to the stretching vibration of C=O group, and at 1620 cm⁻¹ corresponding to the bending

vibration of N-H group or C=C absorption in AAM units (Figure S2a). The monomer O-CMC showed characteristic absorption peaks at 3430 cm^{-1} reflecting the stretching vibration of $-\text{NH}_2$ and $-\text{OH}$ groups, at 2930 cm^{-1} assigned to $-\text{C}-\text{H}$ stretch vibration, and at 1615 cm^{-1} corresponding to N-H group and $-\text{COOH}$ group vibration (Figure S2b). The monomer NVP appeared characteristic absorption peaks at 1710 cm^{-1} ascribed to cyclic amide stretching of C=O group, and at 1630 cm^{-1} corresponding to the C=C group on the NVP structure (Figure S2c). By comparing Figure S2d with Figure S2a, b, and c, the existence of characteristic absorption peaks at 3430, 3186, 2930 and 1670 cm^{-1} proved the formation of the expected polymer hydrogels. The disappearing of the absorption band at 1630 cm^{-1} further indicated that polymer hydrogels were prepared by breaking the C=C bond from the monomers successfully.

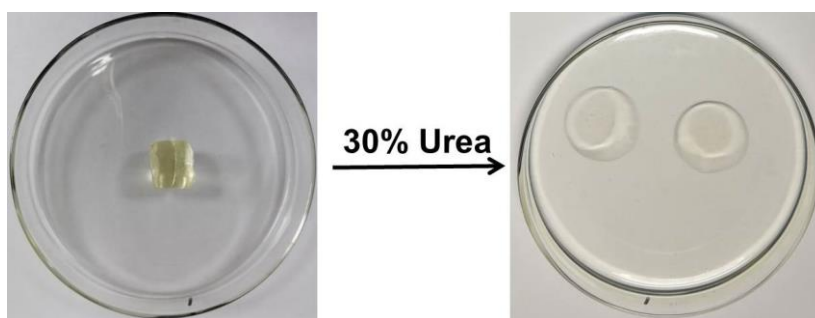


Figure S3. Self-healing hydrogels separated upon exposure to an aqueous solution of 30% urea.

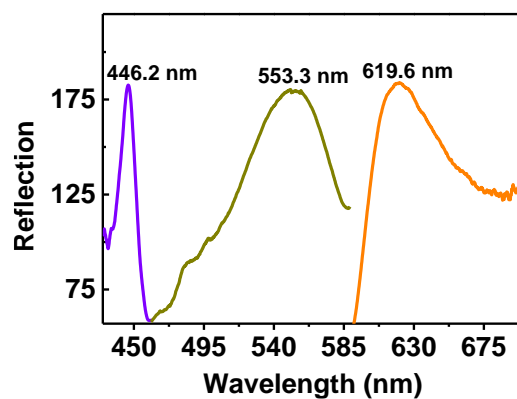


Figure S4. Reflectance spectra of self-healing Colloidal Photonic Crystals (CPCs) hydrogels containing $\text{Fe}_3\text{O}_4@\text{SiO}_2$ CNs with different average sizes of 130 nm, 180 nm and 200 nm.

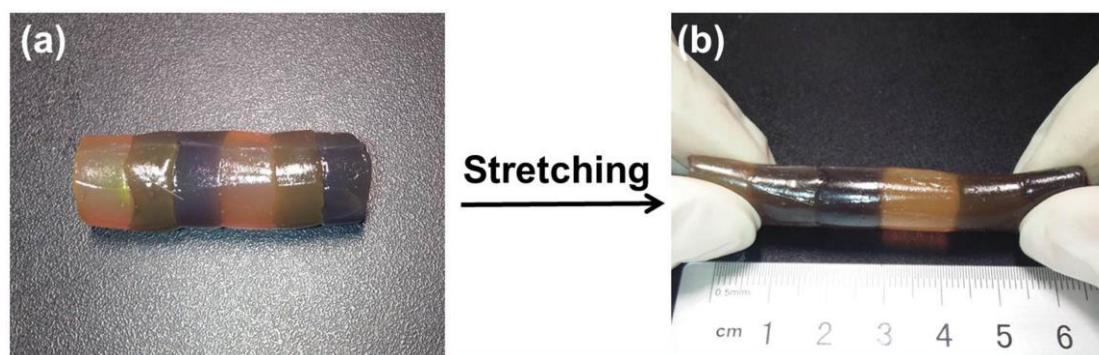


Figure S5. The tensile property of the self-healing CPCs hydrogel after 20 months.

Movie S1. Structural color of the magnetic CPCs changes remarkably with the distance of external magnetic field.

Movie S2. Stretching property of the structural colored CPCs hydrogel.