Supporting Information for

Ion-Cross-Linked Hybrid Photochromic Hydrogels with Enhanced Mechanical Properties and Shape Memory Behaviour

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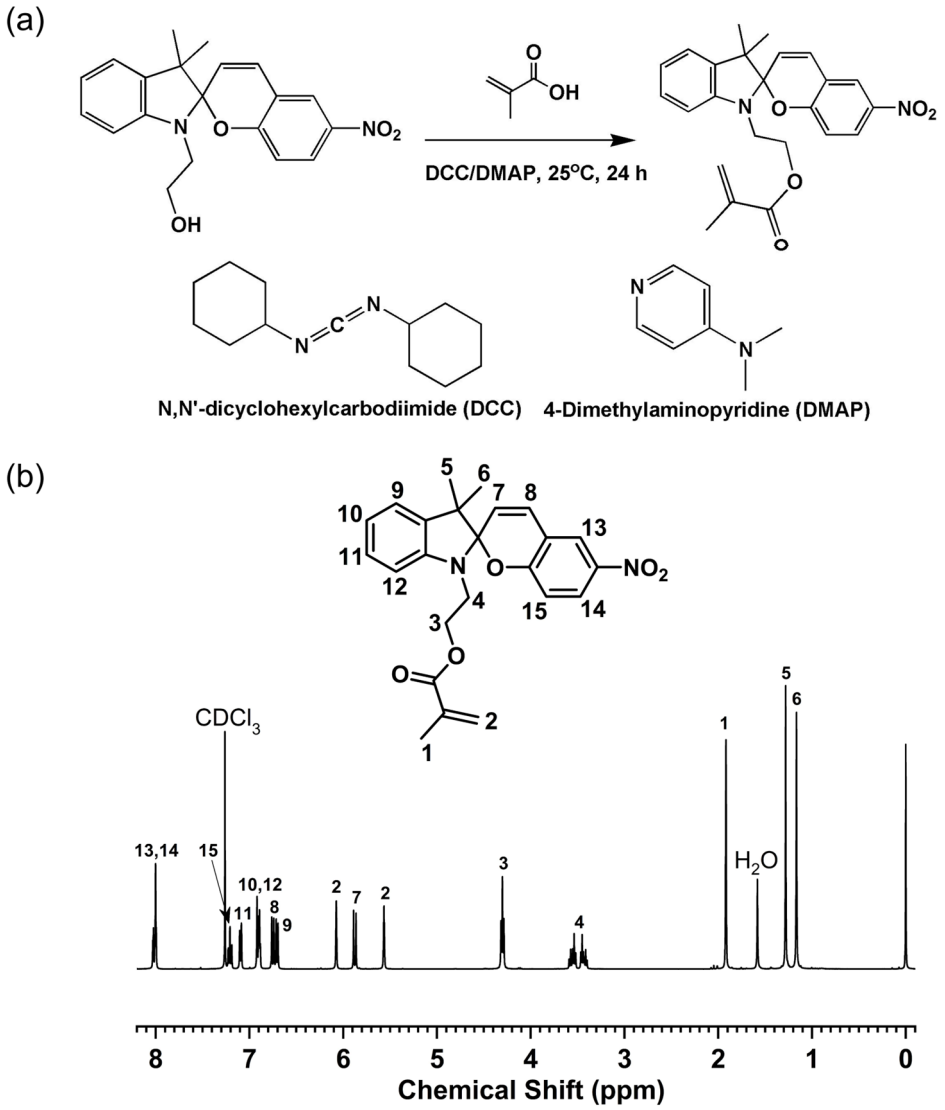

Figure S1. (a) The synthetic route of SPMA. (b) ^{1}H NMR spectrum of SPMA monomer (solvent $CDCl_3$, 400MHz).

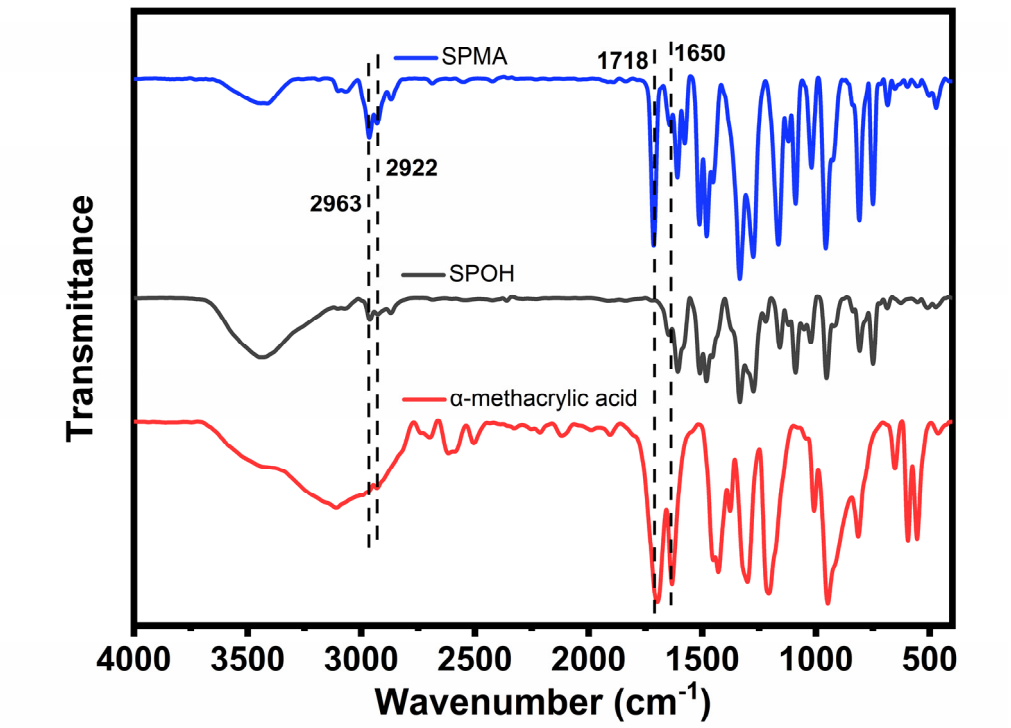

Figure S2. FTIR spectra of SPMA, SPOH and α-methacrylic acid.

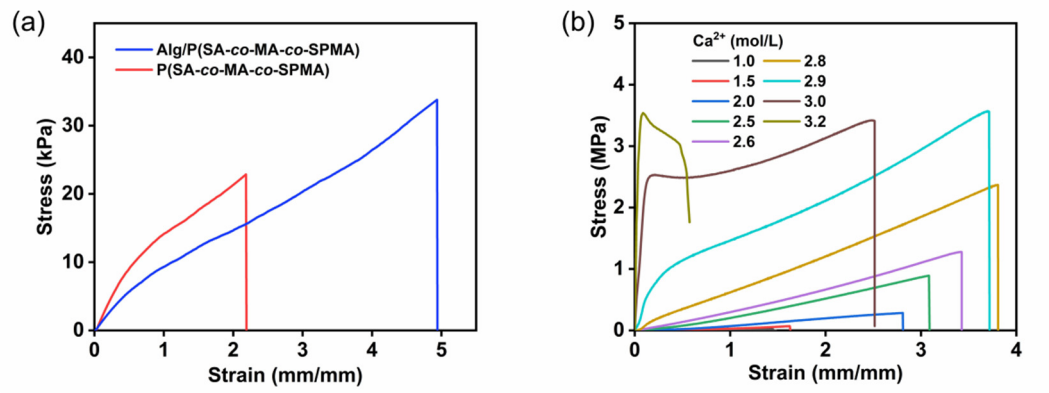

Figure S3. (a) Stress strain curve of P(SA-*co*-MA-*co*-SPMA) hydrogel and Alg/P(SA-*co*-MA-*co*-SPMA) hydrogel. (b) Stress strain curve of Alg/P(SA-*co*-MA-*co*-SPMA)/Ca^{2+} hydrogels soaked in solutions at different Ca^{2+} concentrations.

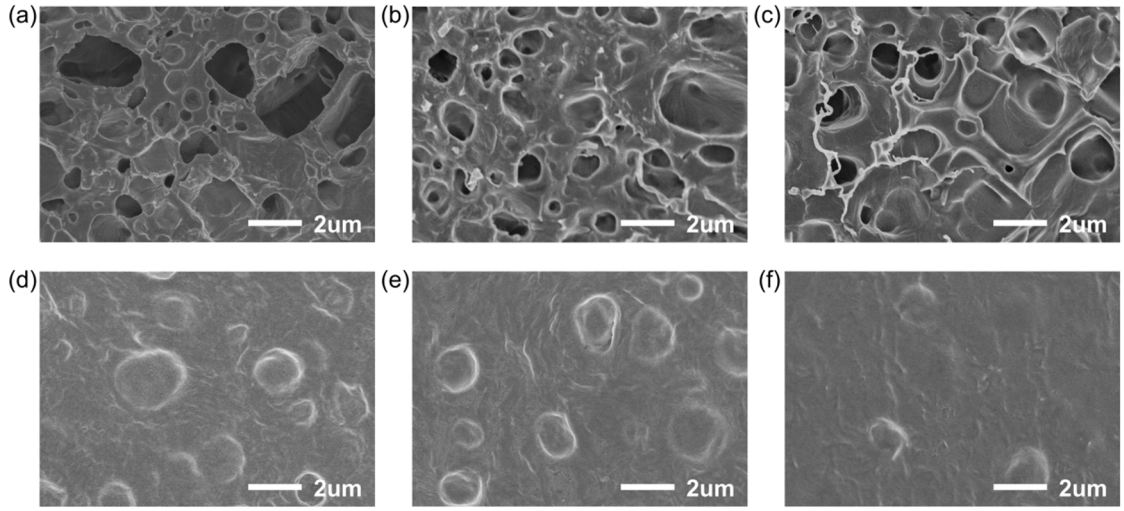

Figure S4. SEM images for cross-sectional morphology of hydrogels (scale bar = 2 μm). (a) P(SA-*co*-MA-*co*-SPMA) hydrogel. (b) Alg/P(SA-*co*-MA-*co*-SPMA) hydrogel. (c) Alg/P(SA-*co*-MA-*co*-SPMA)/$Ca^{2+}_{2.0M}$ hydrogel. (d) Alg/P(SA-*co*-MA-*co*-SPMA)/$Ca^{2+}_{2.6M}$ hydrogel. (e) Alg/P(SA-*co*-MA-*co*-SPMA)/$Ca^{2+}_{2.8M}$ hydrogel. (f) Alg/P(SA-*co*-MA-*co*-SPMA)/$Ca^{2+}_{3.0M}$ hydrogel.

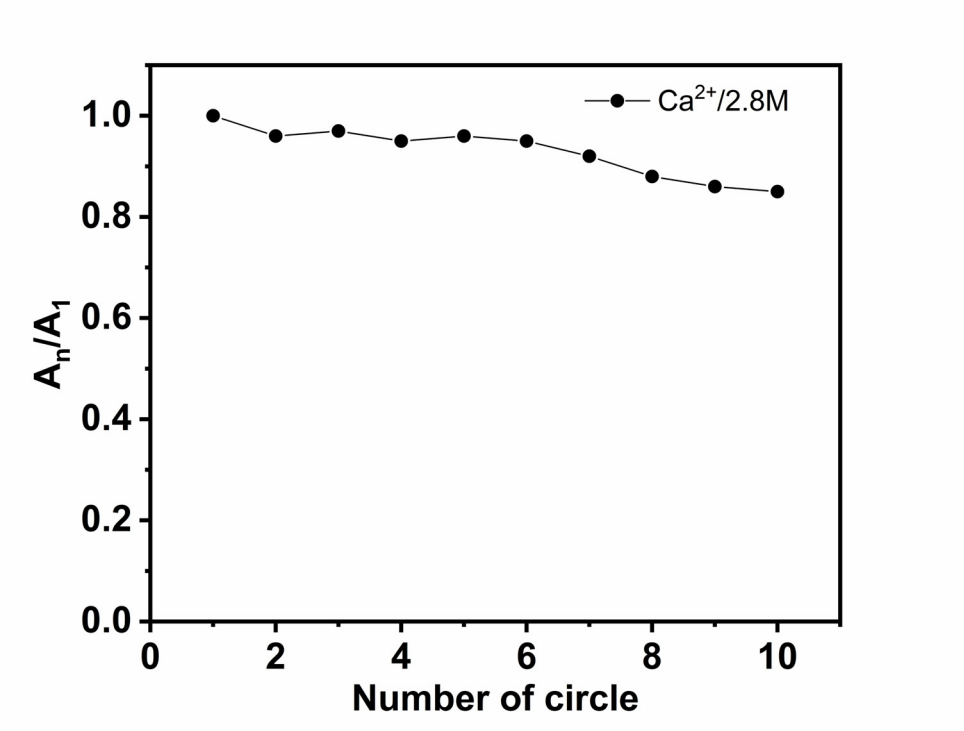

Figure S5. Changes of A_n/A_1 during repeated coloration/discolorization cycle of Alg/P(SA-*co*-MA-*co*-SPMA)/$Ca^{2+}_{2.8M}$ hydrogel irradiated by alternative UV/vis light, where A_1 and A_n represent the intensities for the first and nth cycles at the maximum absorption wavelength.

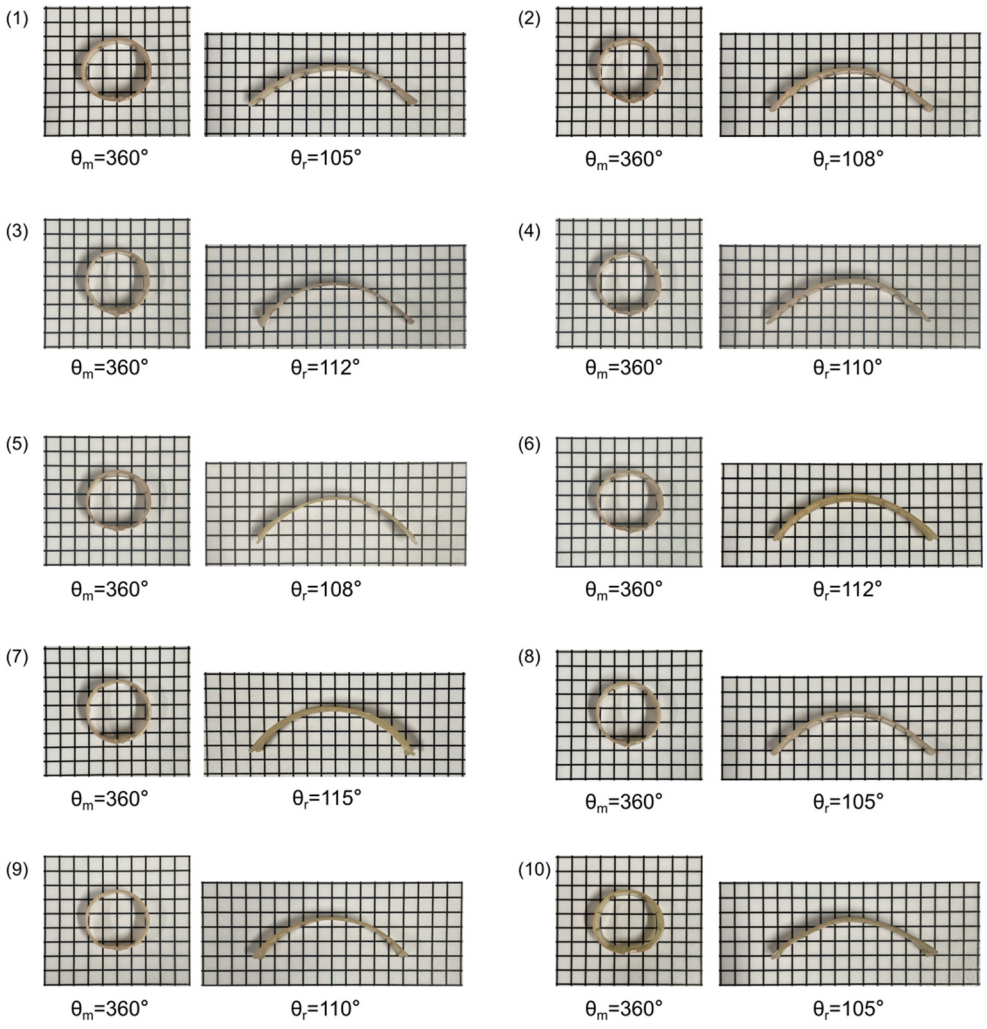

Figure S6. The photos of Alg/P(SA-*co*-MA-*co*-SPMA)/$Ca^{2+}_{2.8M}$ hydrogel conducting 10 cycles of shape fixation and shape recovery.

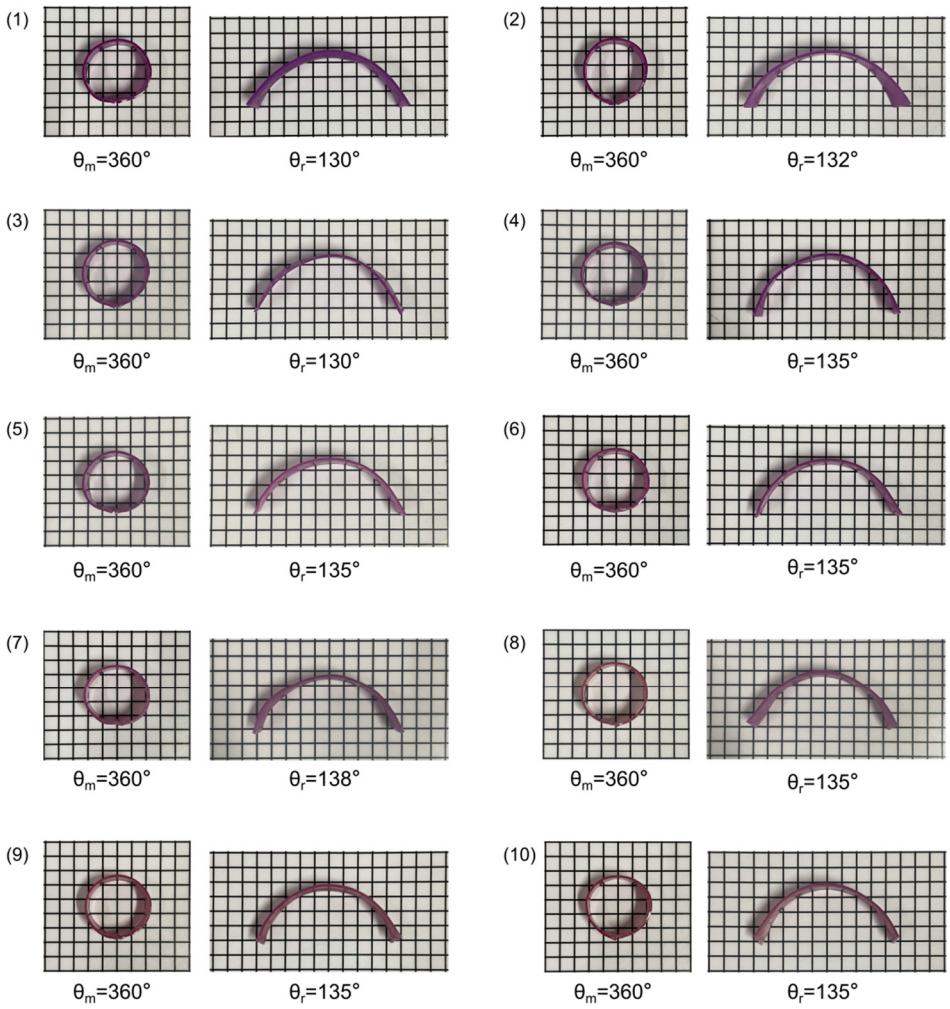

Figure S7. The photos of Alg/P(SA-*co*-MA-*co*-SPMA)/$Ca^{2+}_{2.8M}$ hydrogel conducting 10 cycles of shape fixation and shape recovery under UV irradiation.