

## Supporting Information

### Modulatable Structural Colors in Rapid-Curing High-Performance Hydrogels

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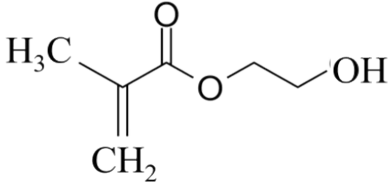
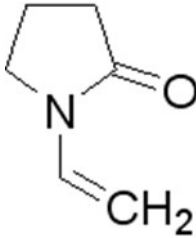
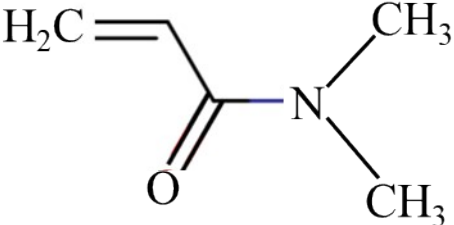
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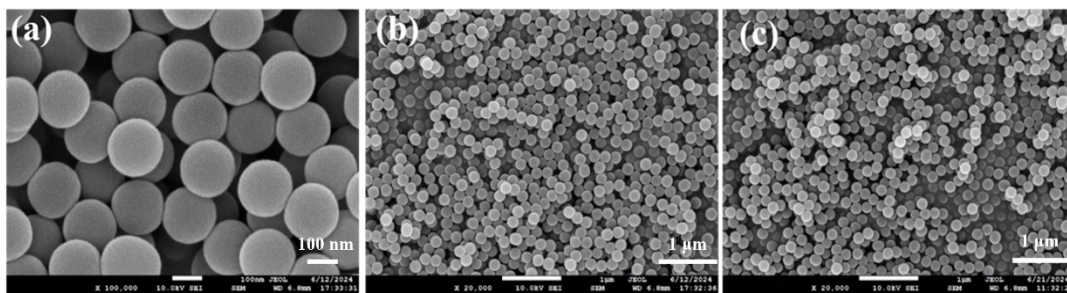
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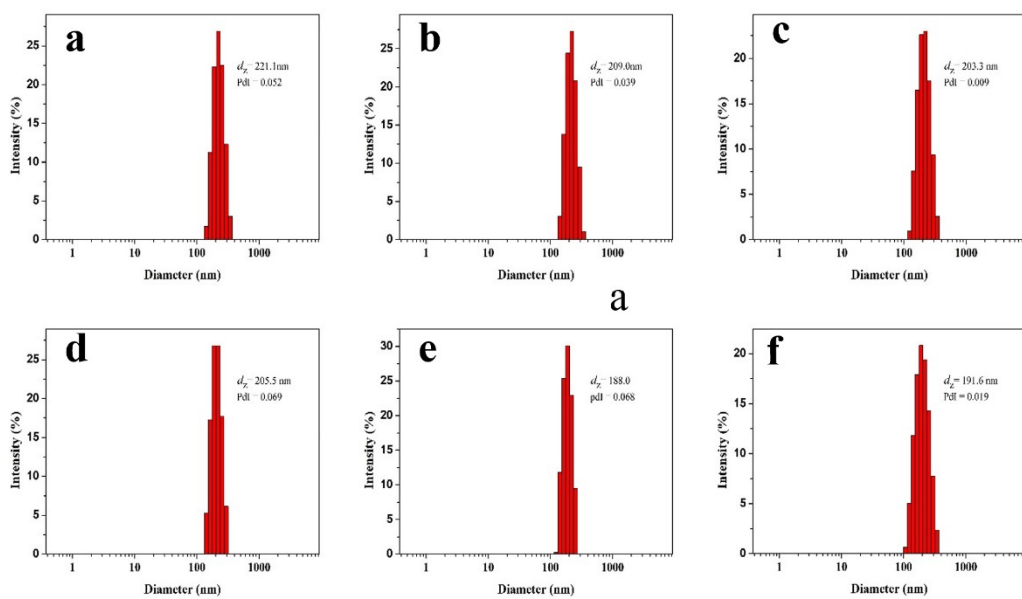
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**Table S1 The abbreviation names of chemical monomers and their structural diagrams**

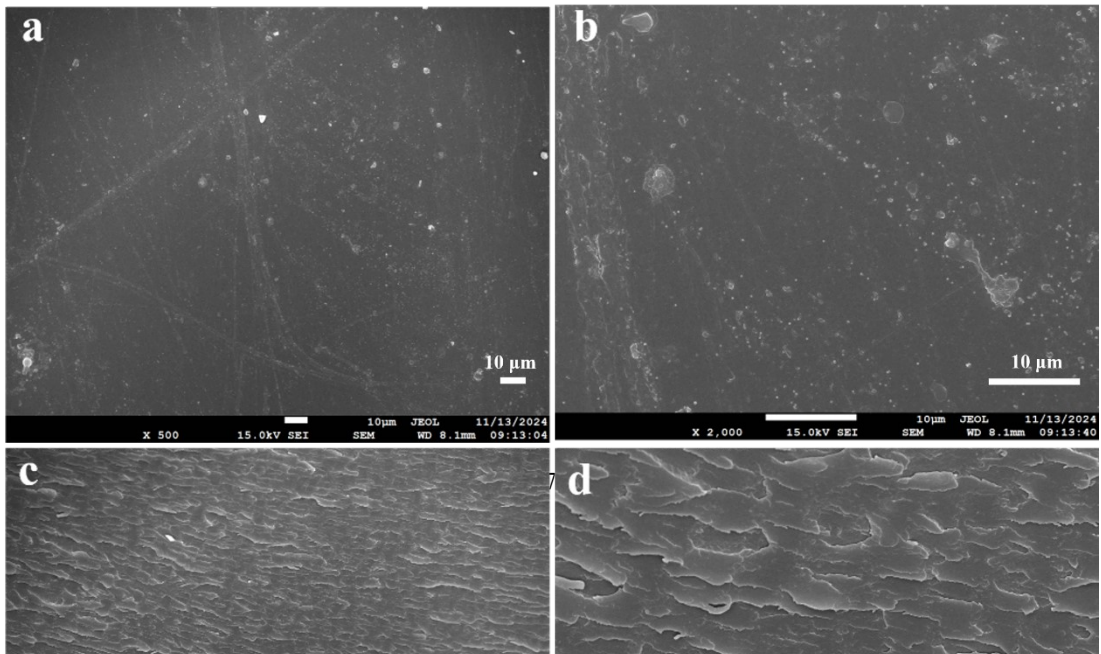
Abbreviation	Chemical Name	Chemical Structure
HEMA	2-Hydroxyethyl methacrylate	
NVP	N-Vinyl-2-Pyrrolidinone	
DMAA	N, N-Dimethylacrylamide	



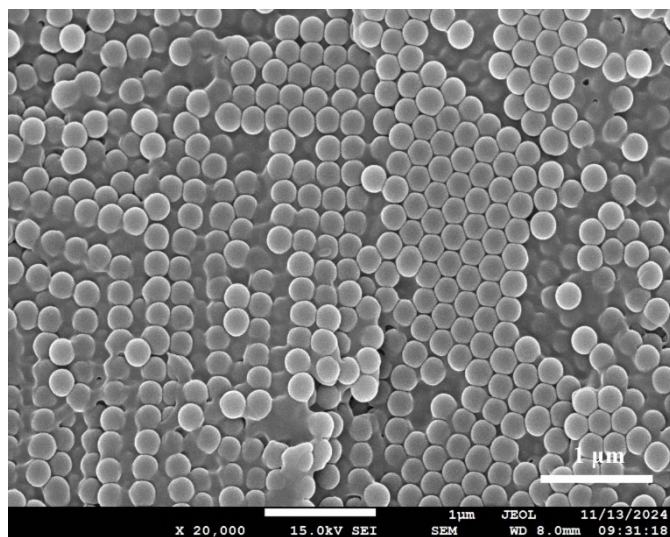
**Fig. S1.** SEM images of SiO<sub>2</sub> particles with different diameters.



**Fig. S2.** Pictures of different dynamic light scattering data from synthetic colloidal silica nanoparticles.



**Fig. S3.** SEM images of gel from different perspective. a and b, was surface area, b, c was cross section of different multiples. e, lenses prepared by the hydrogel we synthesized.



**Fig. S4.** SEM image of contact lens at cross section at high magnification.

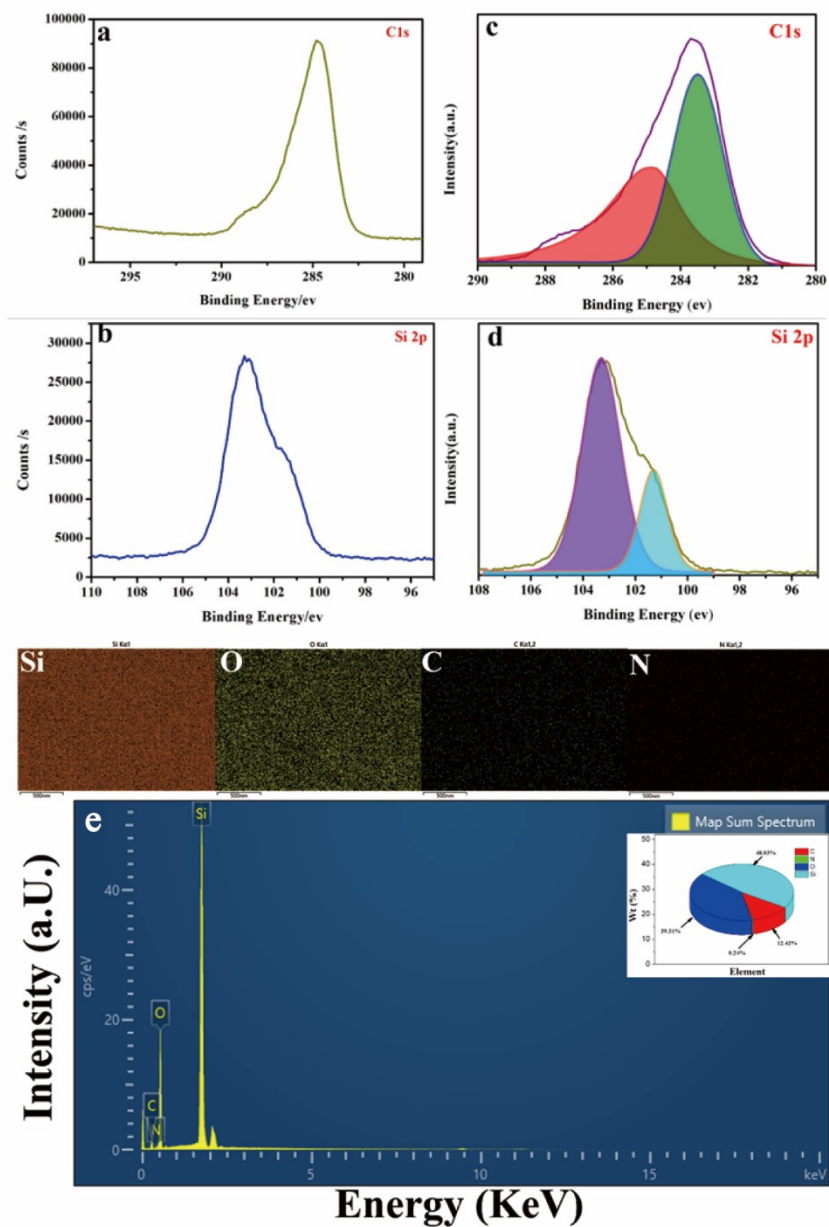
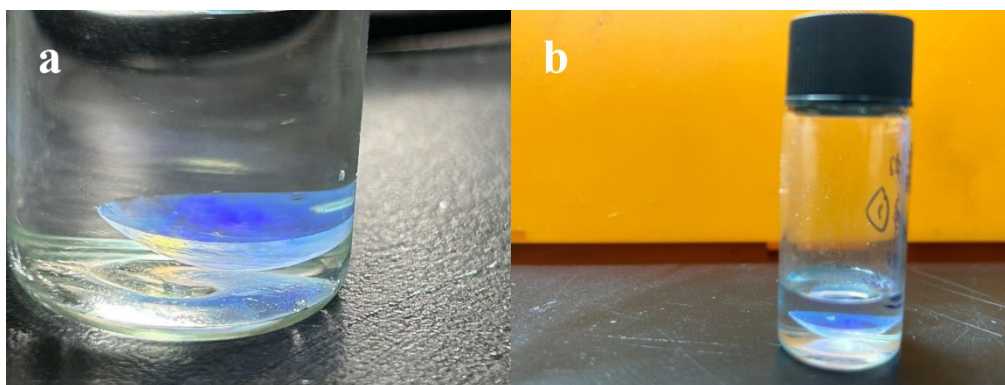
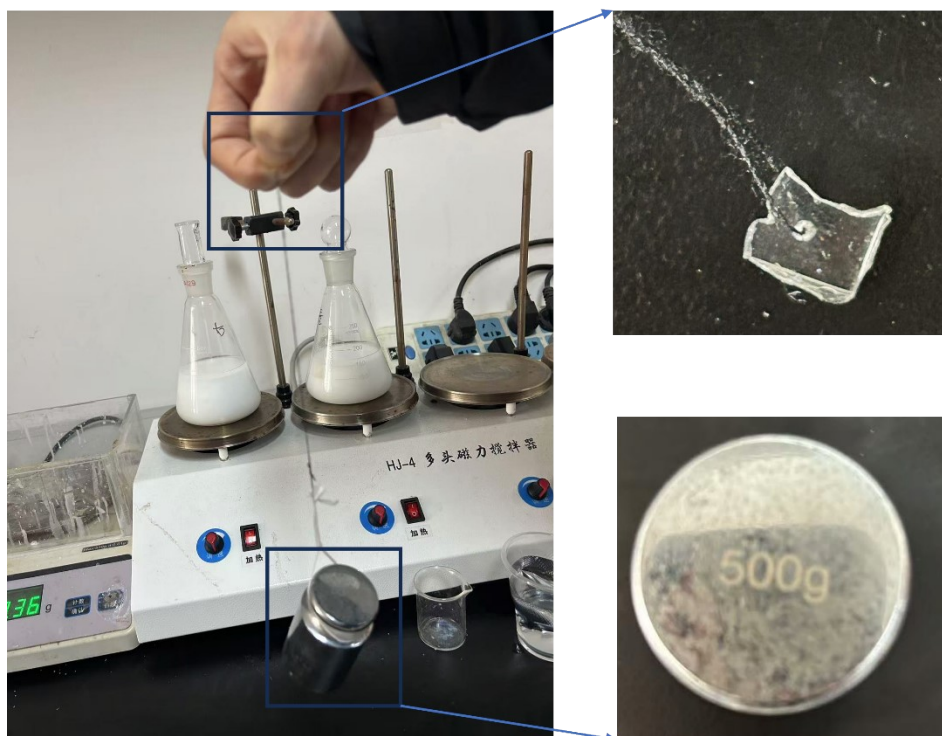


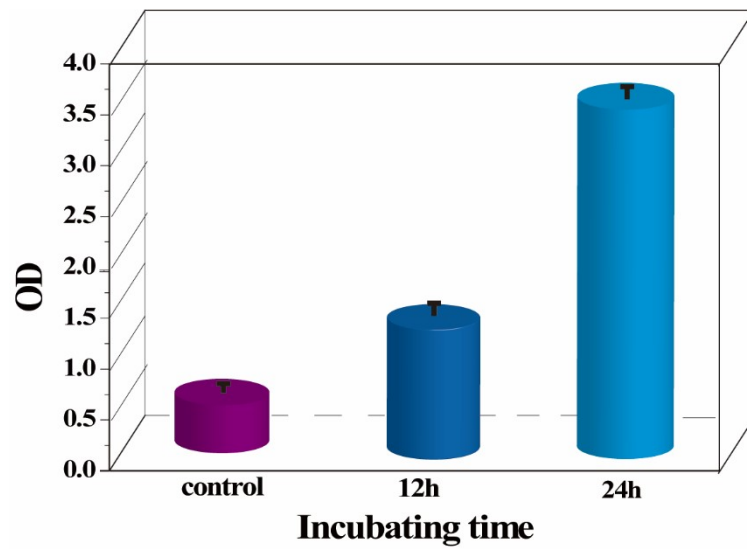
Fig. S5. XPS high-resolution spectra of (a) C1s and (b) Si 2p from the contact lens. (c) Elemental mapping (C, N, O, Si) and (d) corresponding EDX spectrum of a structural color lens prepared by the non-pigmented method.



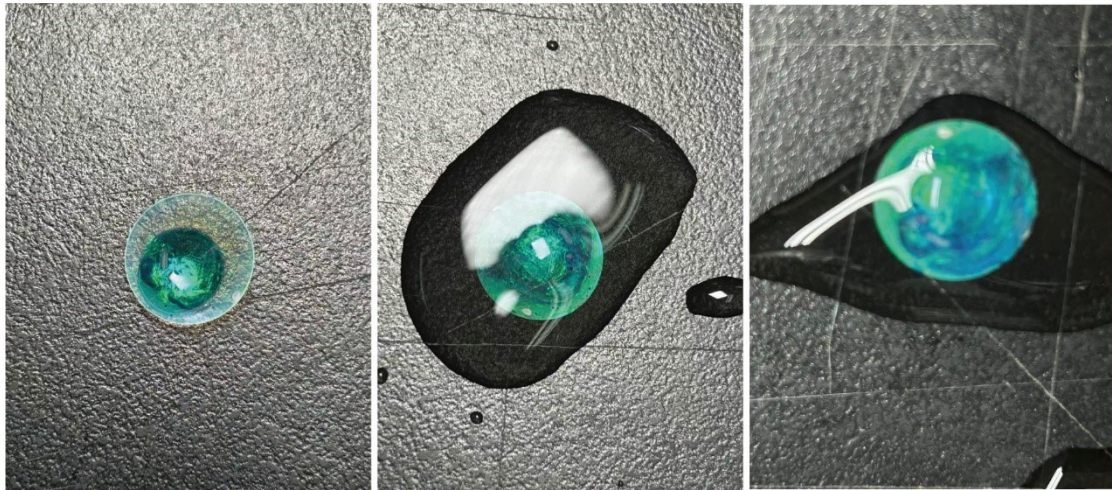
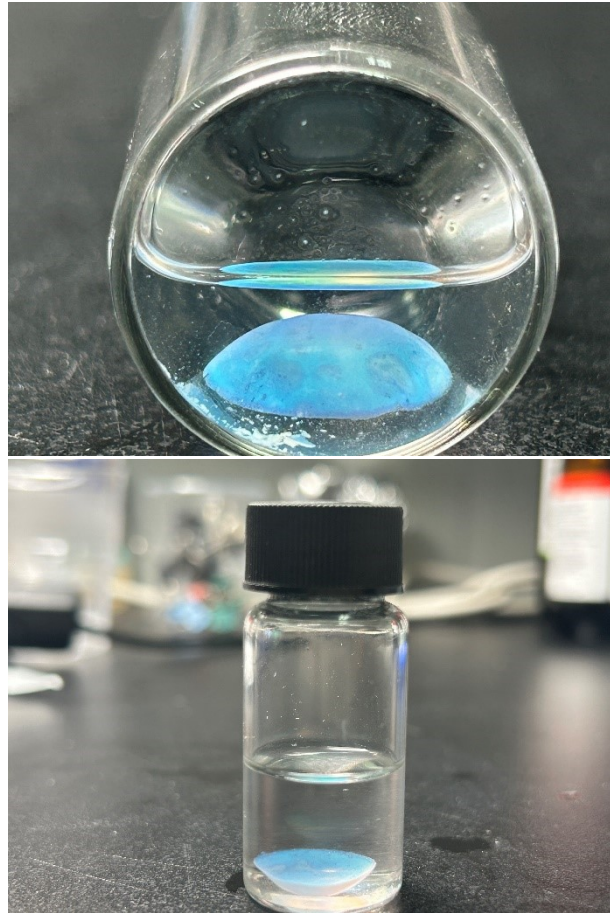
**Fig. S6.** Optical images of the color contact lens achieved before (a) and after 200 days (b).



**Fig. S7.** The test for the bearing capacity of the developed hydrogel.



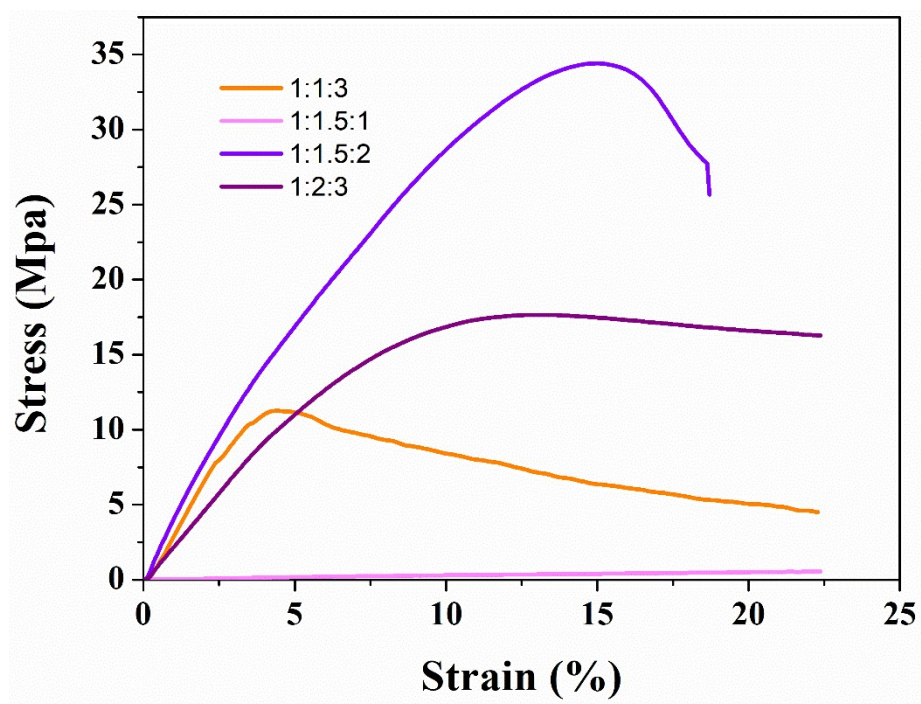
**Fig. S8.** The CCK-8 test using MCF-7 cells of cosmetic contact lenses for the cell viability assay. In the experimental group, the lens was incubated with cells for 12h and 24h.



**Fig S9.** The pictures of different cosmetic contact lenses from different perspective.

**Table S2** : Comparison of mechanical properties and curing time under different proportions of monomer ratios

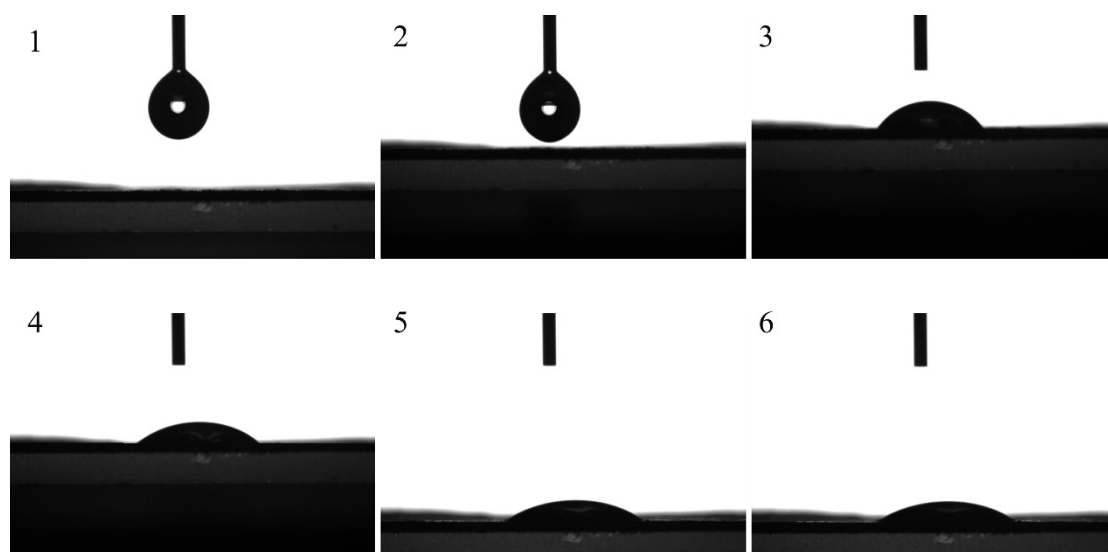
<b>Ratio</b>	<b>Modulus of Elasticity (MPa)</b>	<b>Fracture Strain (MPa)</b>	<b>Modulus of Elasticity (MPa)</b>	<b>Tensile Strength (MPa)</b>	<b>Maximum Force (N)</b>
<b>1:1:3</b>	<b>373.78</b>	<b>22.38</b>	<b>4.51</b>	<b>11.26</b>	<b>22.3</b>
<b>1:1.5:1</b>	<b>4.03</b>	<b>62.51</b>	<b>0.47</b>	<b>1.03</b>	<b>2.42</b>
<b>1:1.5:2</b>	<b>406.72</b>	<b>18.79</b>	<b>25.67</b>	<b>34.41</b>	<b>96.62</b>
<b>1:2:3</b>	<b>241.05</b>	<b>33.29</b>	<b>7.19</b>	<b>17.66</b>	<b>49.6</b>



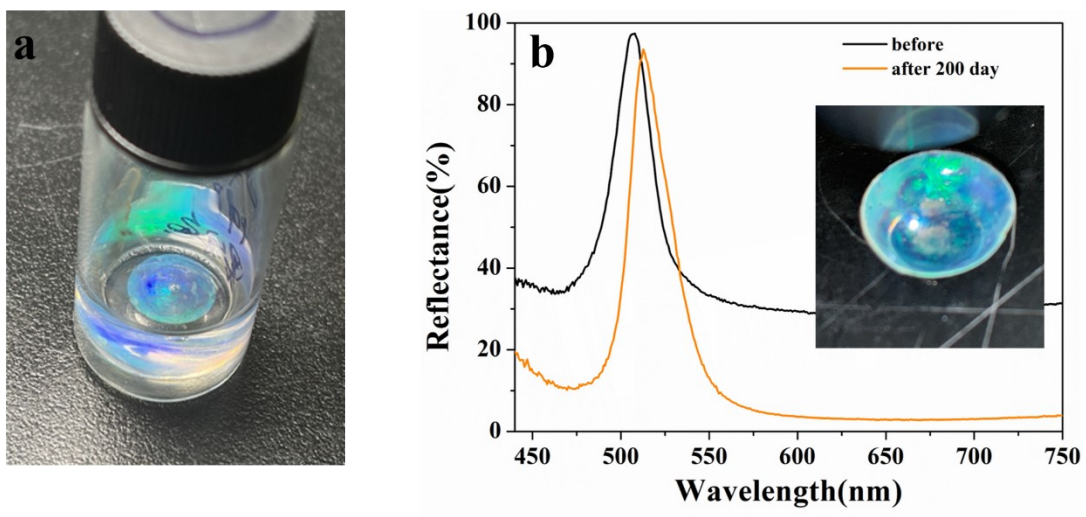
**Fig. S10** Stress-strain curves of hydrogels based on different monomer ratio ratios.



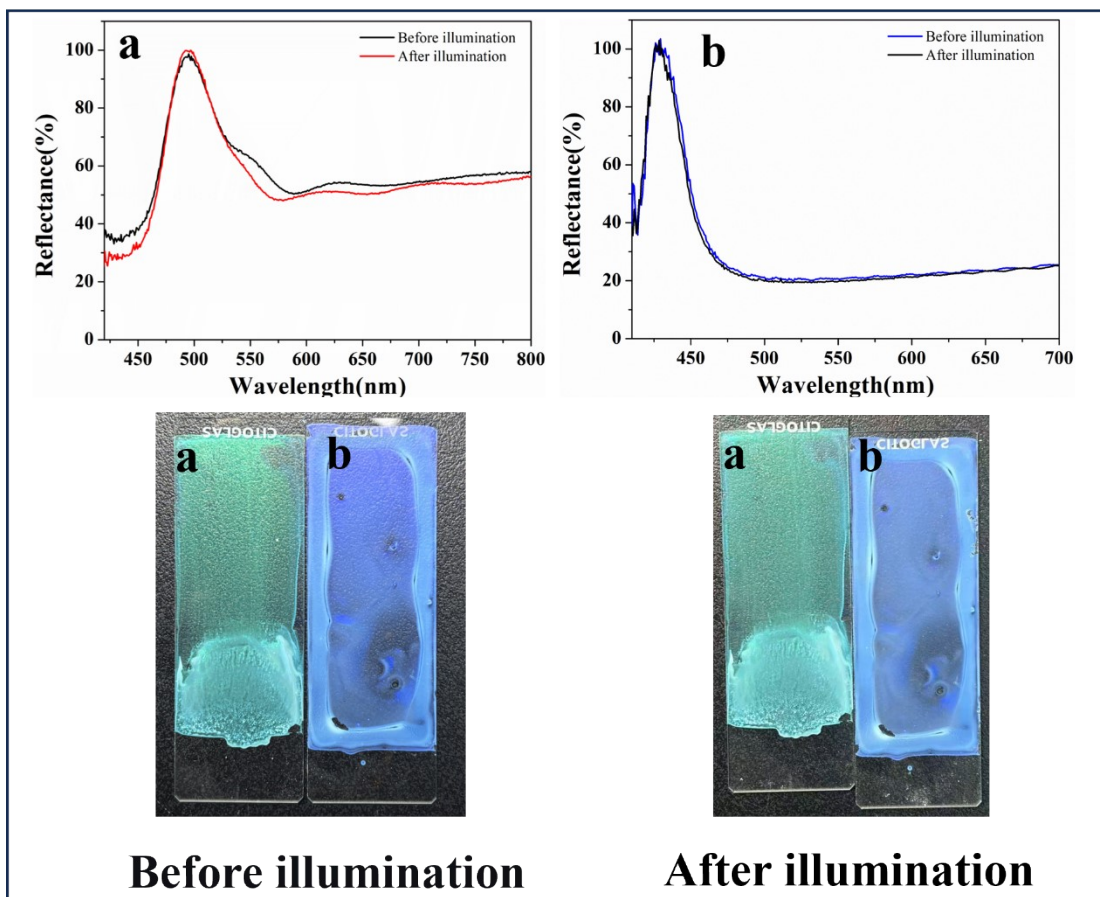
**Fig.S11** Static contact Angle test of hydrogels.



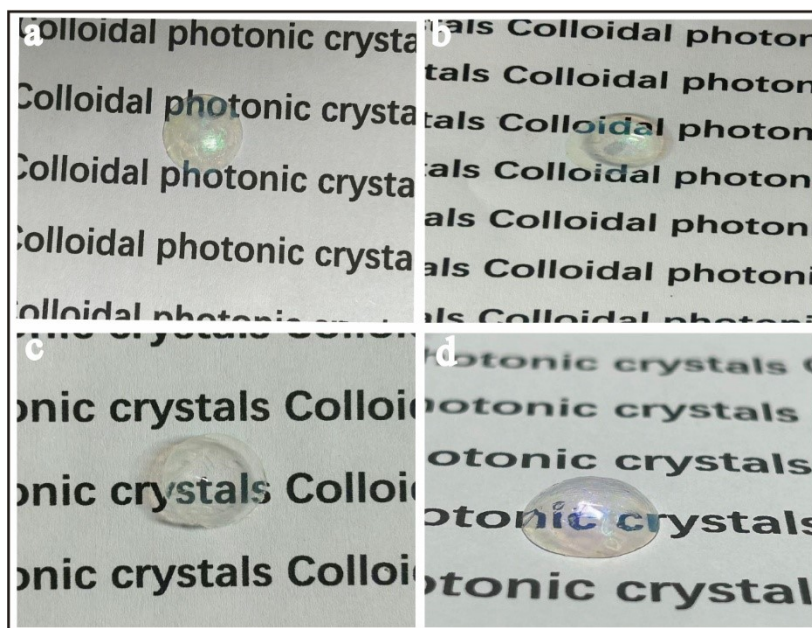
**Fig.S12** Representative images showing the evolution of the dynamic contact angle over time.



**Fig. S13.** (a) Photograph of the lens taken under lamp illumination on December 13, after being stored for over 200 days. (b) Comparison of the reflection peaks of the lens before and after the 200-day storage period. The inset shows a photograph of the lens under a microscope light source.



**Fig.S14** Comparison of the reflection peaks and photos of photonic crystals prepared by the scraping method before and after being irradiated by a 5-hour ultraviolet lamp.



**Fig.S15** Demonstration of Transparency of Structural Color Lens Images

## References

1. Shen, X.; Du, J.; Sun, J.; Guo, J.; Hu, X.; Wang, C., Transparent and UV Blocking Structural Colored Hydrogel for Contact Lenses. *ACS Applied Materials & Interfaces* 2020, *12* (35), 39639-39648.
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3. Yang, F.; Wu, S.-T.; Lei, X.-Q.; Han, X.-L.; Chen, P.; Ding, S.-N., Novel SiO<sub>2</sub> photonic crystal microspheres as inorganic pigments for structural color contact lenses. *Optical Materials* 2023, *138*, 113705.
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