

Supporting Information

3D Printable and Stimuli-Responsive Colorimetric Silicone Composites

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Materials and Characterizations

All reagents and solvents were purchased from Sigma-Aldrich, Macklin, and Energy Chemicals (China) and used without further purification unless otherwise stated. Fluorescein-free acid, bromocresol green and cresol red were purchased from Sigma-Aldrich. The derivatives of rhodamine (denoted as Rho-1) and zinc phthalocyanine (denoted as ZnPC) were synthesized according to the procedures from literature.^{1,2} Histamine, triethylamine, 1,4-diaminobutane, and 1,5-diaminopentane were purchased from Macklin. Silicone gel DOWSIL SE 1700 Clear Base and corresponding curing agent for 3D printing were purchased from DOW. Electrospray ionization-mass spectrometry (ESI-MS) spectrum was obtained on a Waters Xevo G2-XS Tof using acetonitrile as solvent. UV-vis spectra were recorded using a UV-vis spectrophotometer (UV 1900, Shimadzu). Steady-state photoluminescence (PL) spectra were recorded on a SPEX Fluorolog spectrofluorometer (Jobin Yvon/SPEX, Edison, New Jersey).

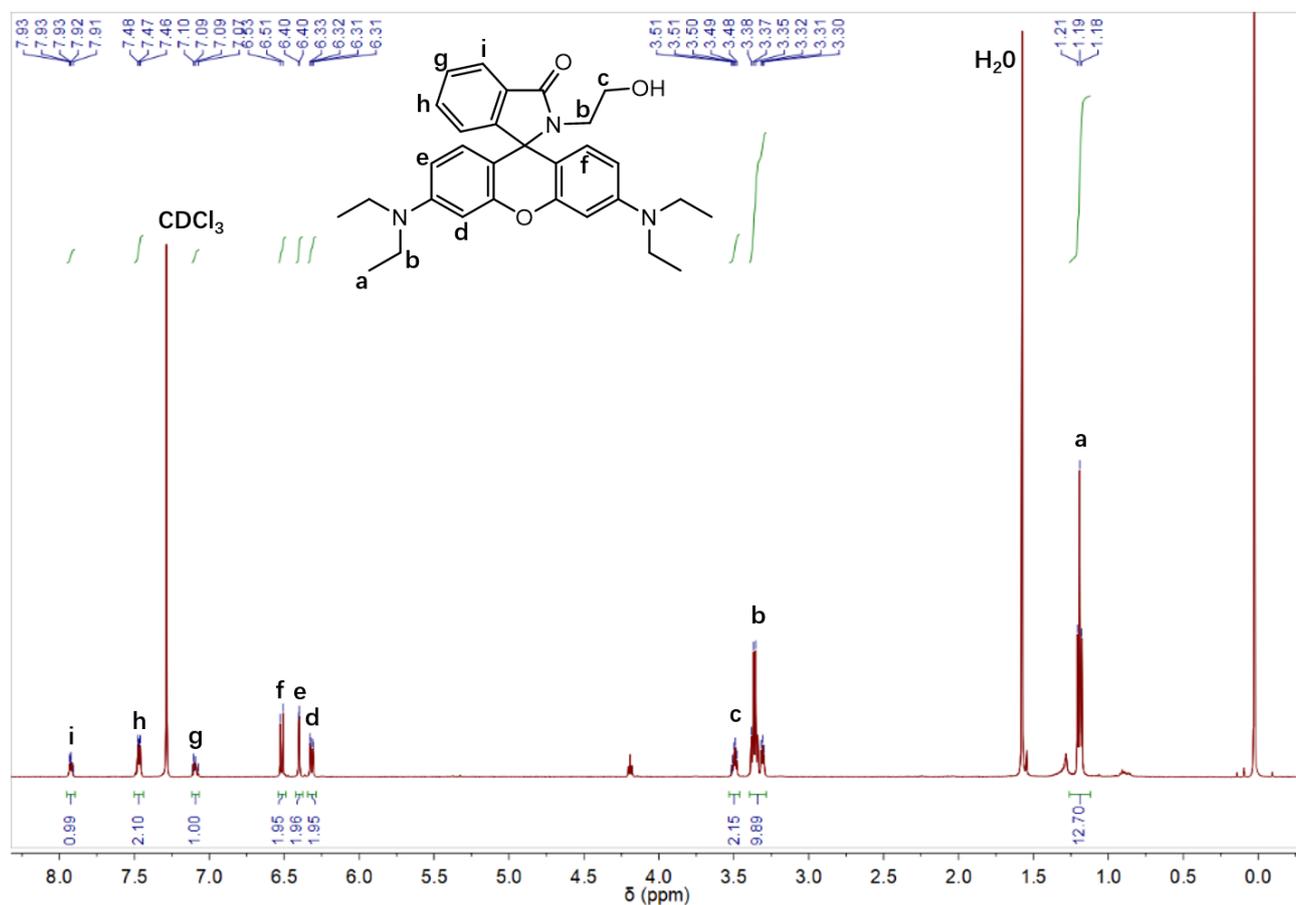


Figure S2. ¹H NMR (CDCl₃, 500 MHz) spectrum of **Rho-1**.

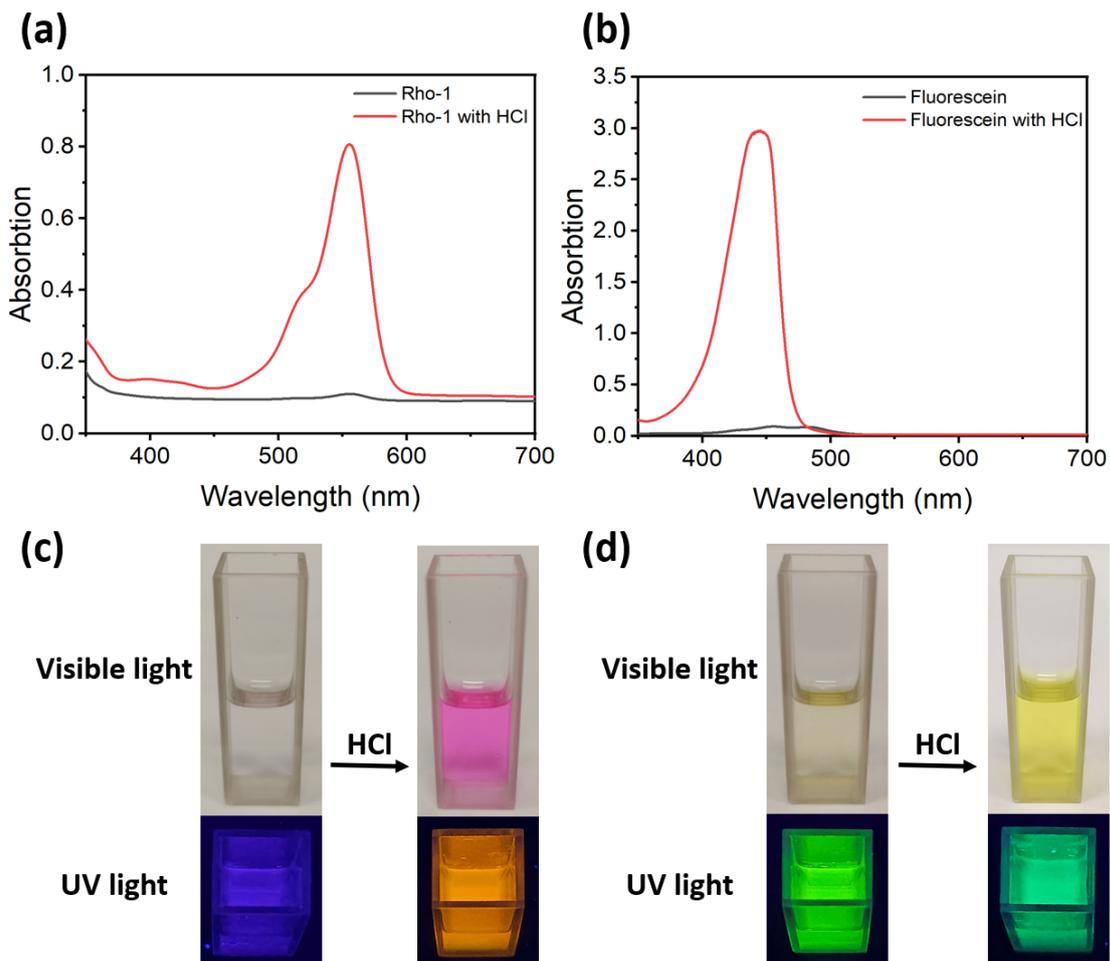


Figure S3. UV-vis absorption spectra of (a) **Rho-1** ethanol solution (1×10^{-3} M), (b) fluorescein ethanol solution (1×10^{-4} M), with and without HCl (0.1 M in water); (c-d) Digital photographs of (a) and (b) under visible light and 365-nm UV light.

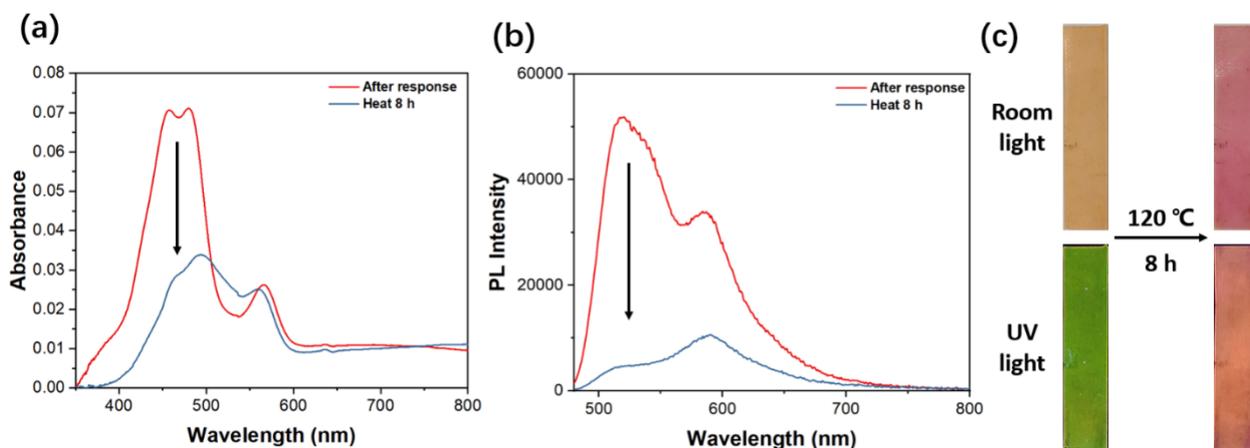


Figure S4. UV-vis absorption (a) and steady-state PL emission spectra (excited at 470 nm) (b) and digital photographs (c) of **DUCS-1** samples before and after being heated at 120 °C for 8 h.

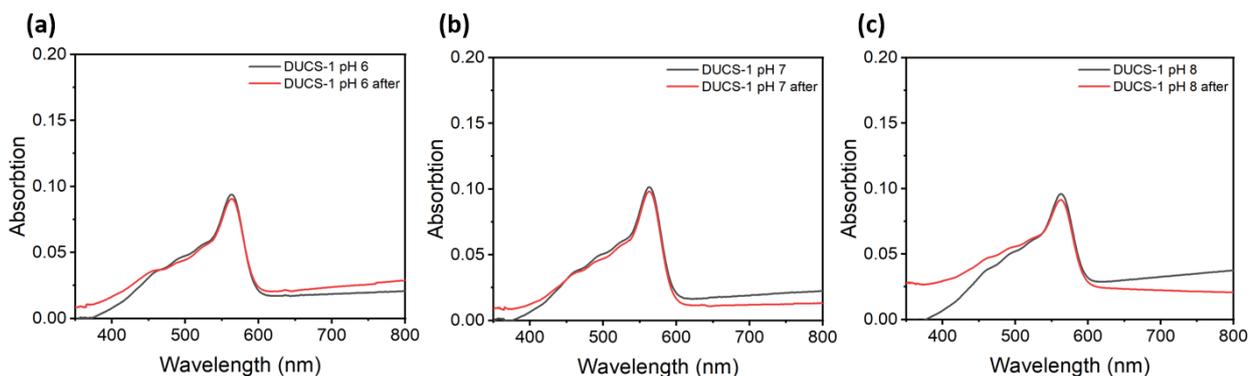


Figure S5. UV-vis absorption spectra of **DUCS-1** films before and after being soaked in aqueous media at different pH values: (a) pH 6, (b) pH 7 and (c) pH 8 for 48 h.

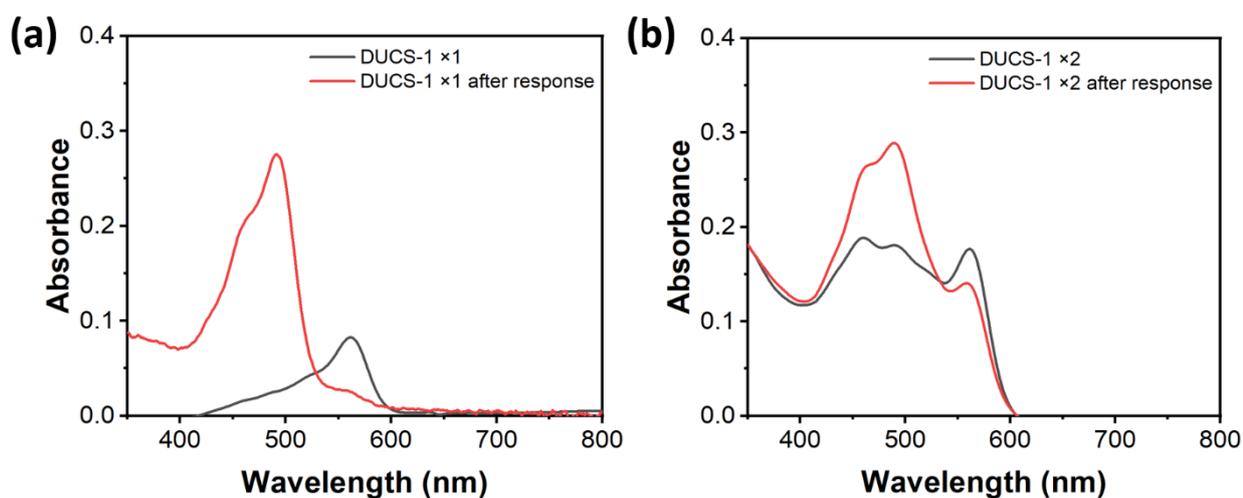


Figure S6. UV-vis absorption spectra of **DUCS-1** (a) with original concentration (Rho-1: 0.01 M, 300 μ L, and fluorescein (0.01 M, 300 μ L) in silicone gel (7.8 g) with the curing agent (0.9 g)), and concentrations of Rho-1 and fluorescein doubled (b) based on those in (a). All the samples were treated with ammonia at 10^4 ppm for 15 min before the measurement.

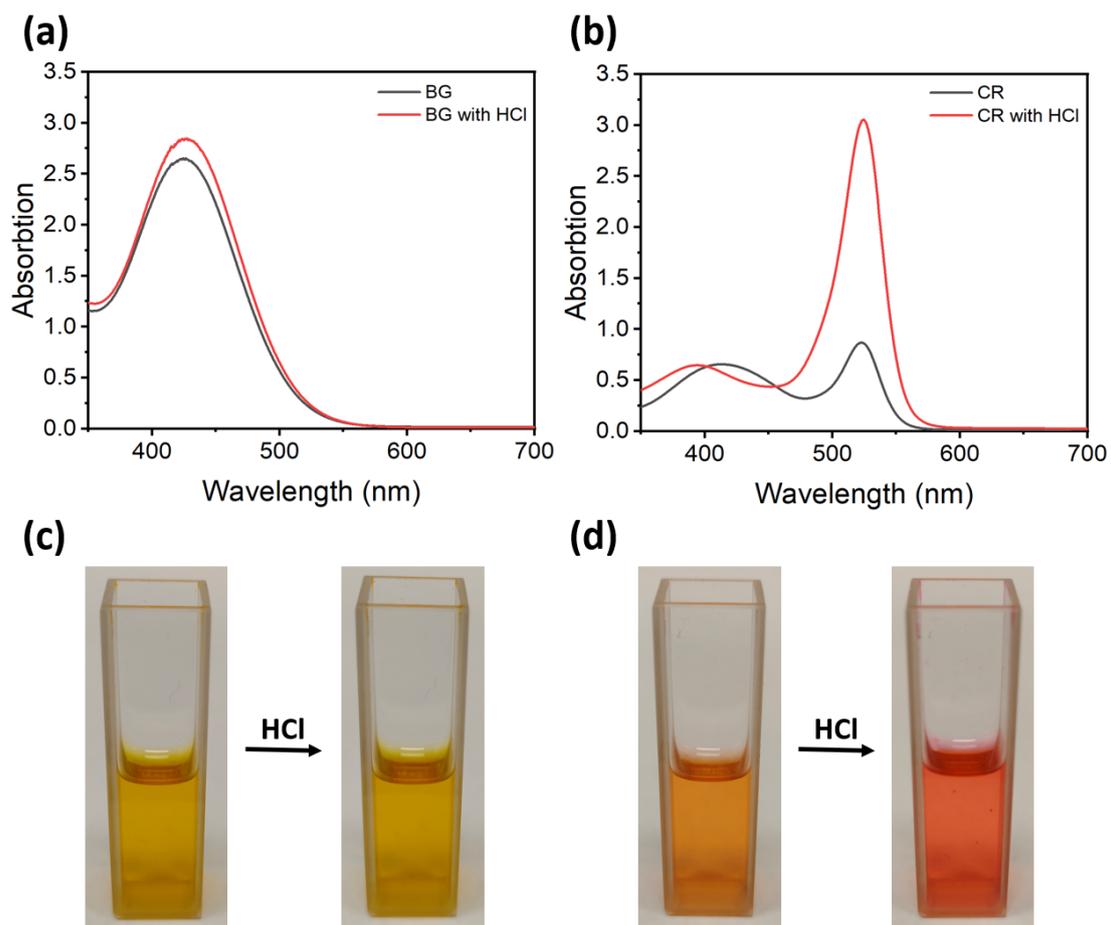


Figure S7. UV-vis absorption spectra (a, b) and digital photographs (c, d) of (a, c) bromocresol green (BG) (2×10^{-4} mmol/mL in ethanol), and (b, d) cresol red (CR) (2×10^{-4} mmol/mL in ethanol), with and without 0.1 mmol/mL HCl.

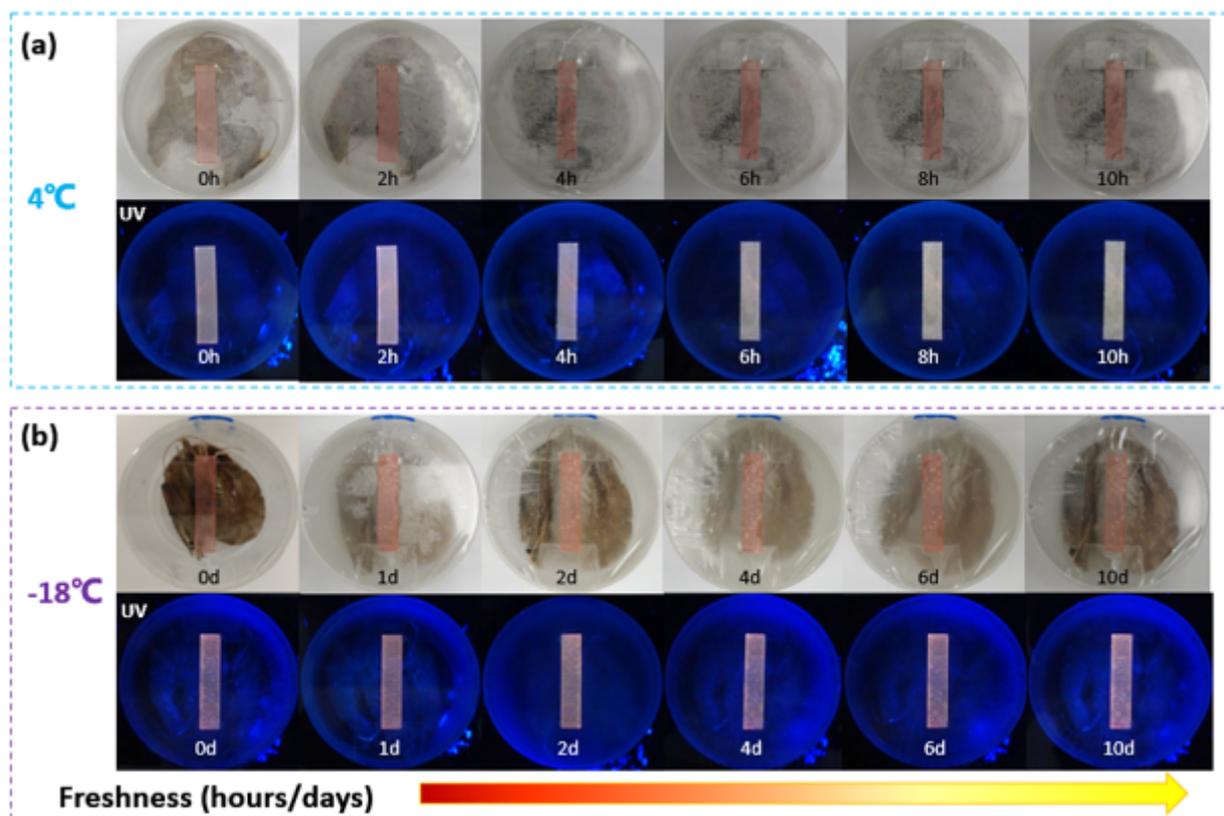


Figure S8. Monitoring of shrimp freshness by the **DUCS-1** sensor. Digital photographs of the sensor strips to monitor the freshness of 2 shrimps stored at (a) 4 °C and (b) -18 °C, respectively, under room light and UV (365 nm) light.

References:

1. H. Zhang, X. Wei, M. B. Chan-Park and M. Wang, *ACS Food Sci. Technol.*, 2022, **2**, 703–711.
2. Z. Xu, L. Mei, Y. Shi, M. Yun, Y. Luan, Z. Miao, Z. Liu, X.-M. Li, M. Jiao, *Biomacromol.* 2022, **23**, 2778-2784.