Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

The design of multi-functional ionic hydrogels with anti-Freezing, temperature response and luminescence properties

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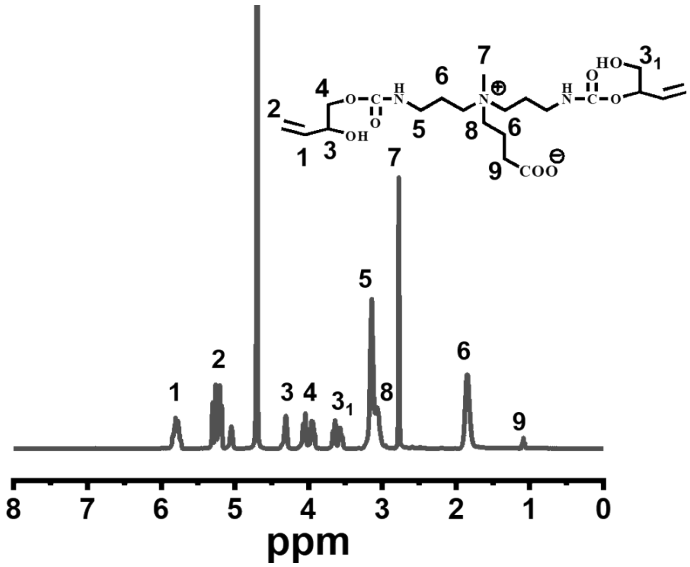
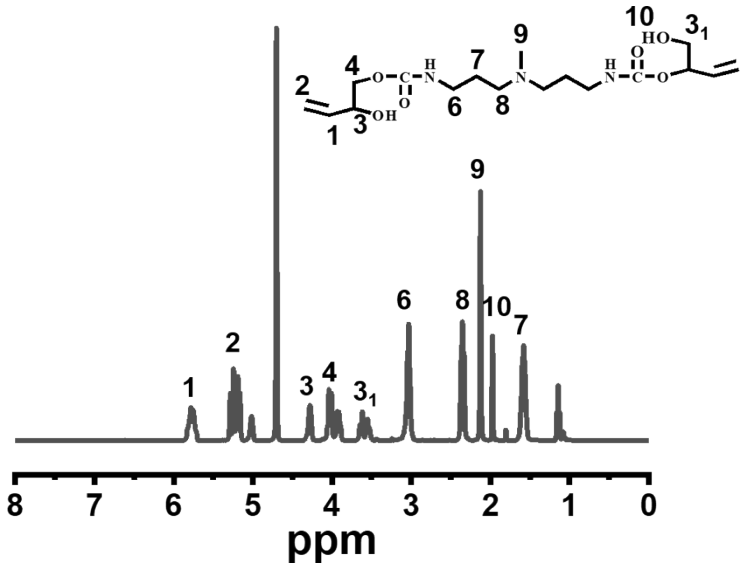
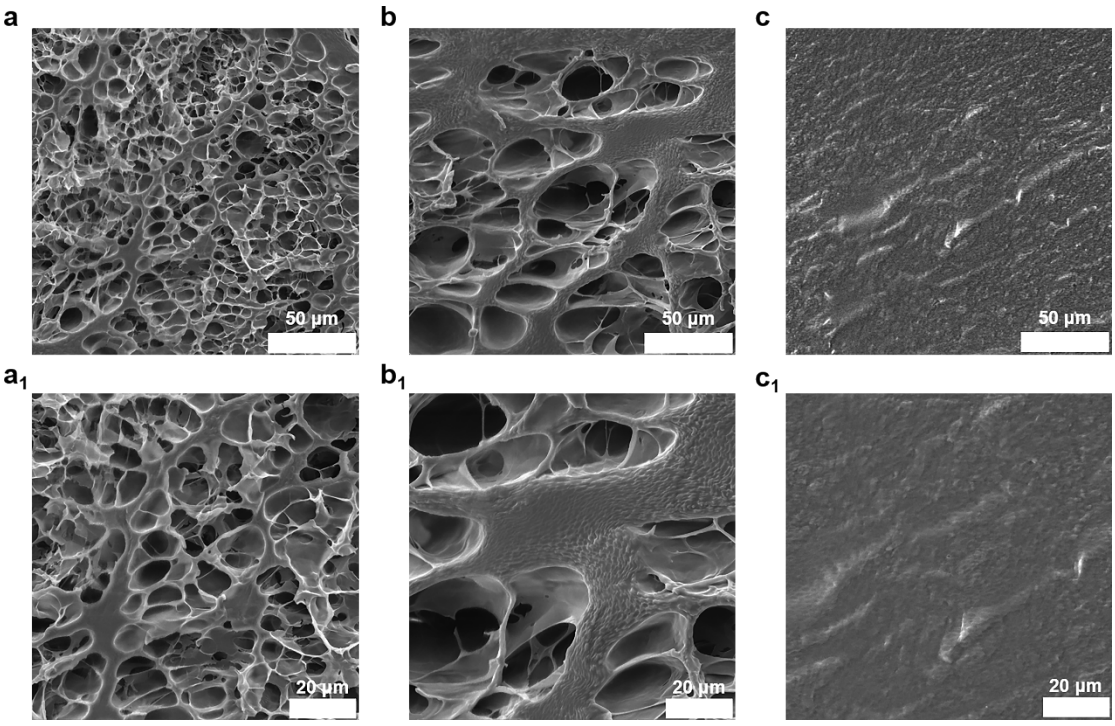


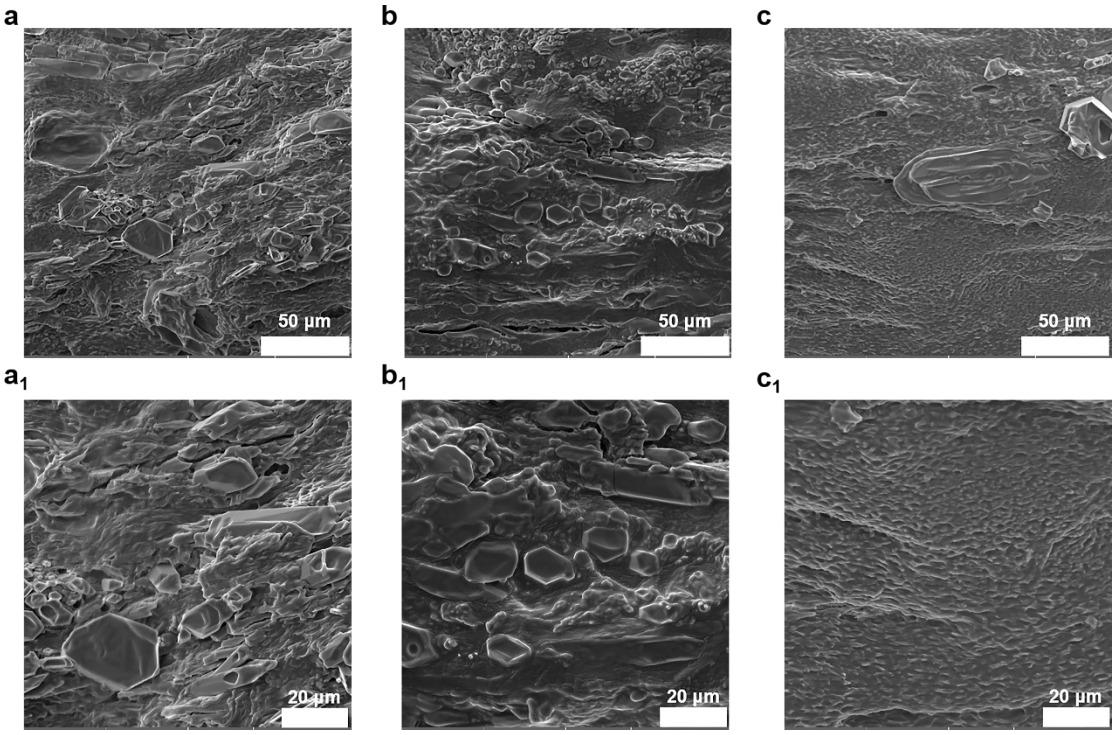
Supplementary Figure S1. ^{1}H-NMR spectrum of CNPU.



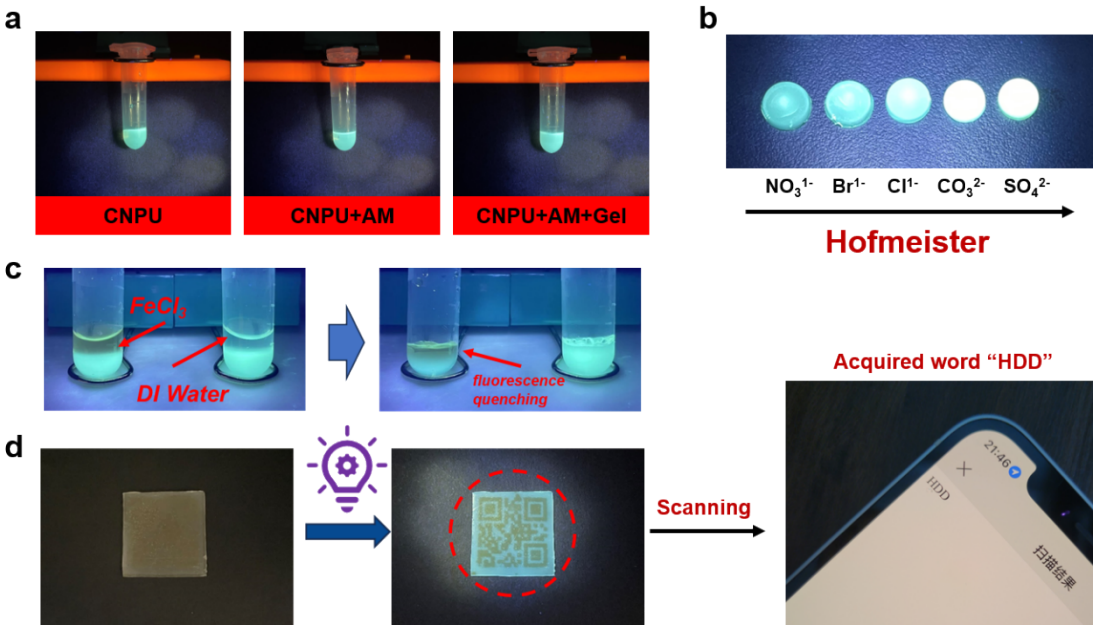
Supplementary Figure S2. ^{1}H-NMR spectrum of precursor.



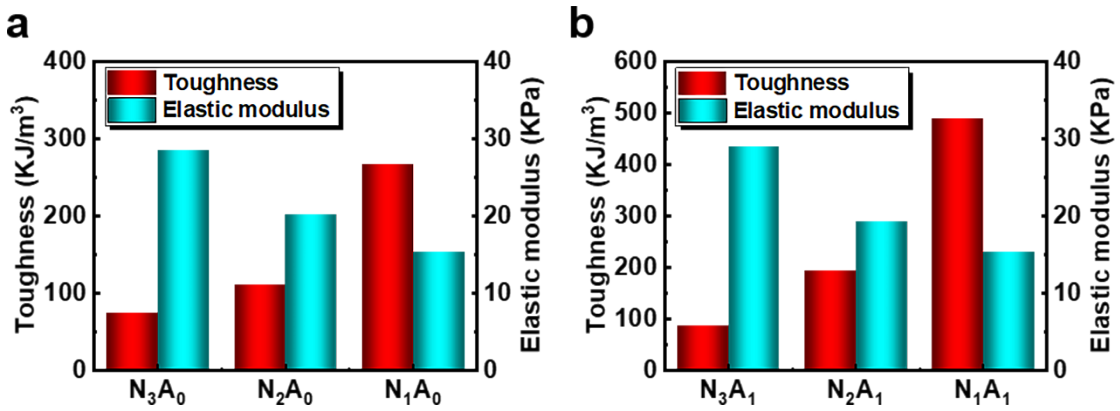
Supplementary Figure S3. SEM images of N_xA_0: (a, a_1) N_1A_0, (b, b_1) N_2A_0, (c, c_1) N_3A_0.



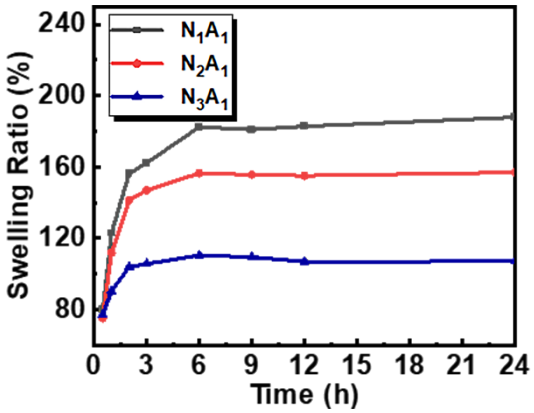
Supplementary Figure S4. SEM images of N_xA_1: (a, a_1) N_1A_1, (b, b_1) N_2A_1, (c, c_1) N_3A_1.



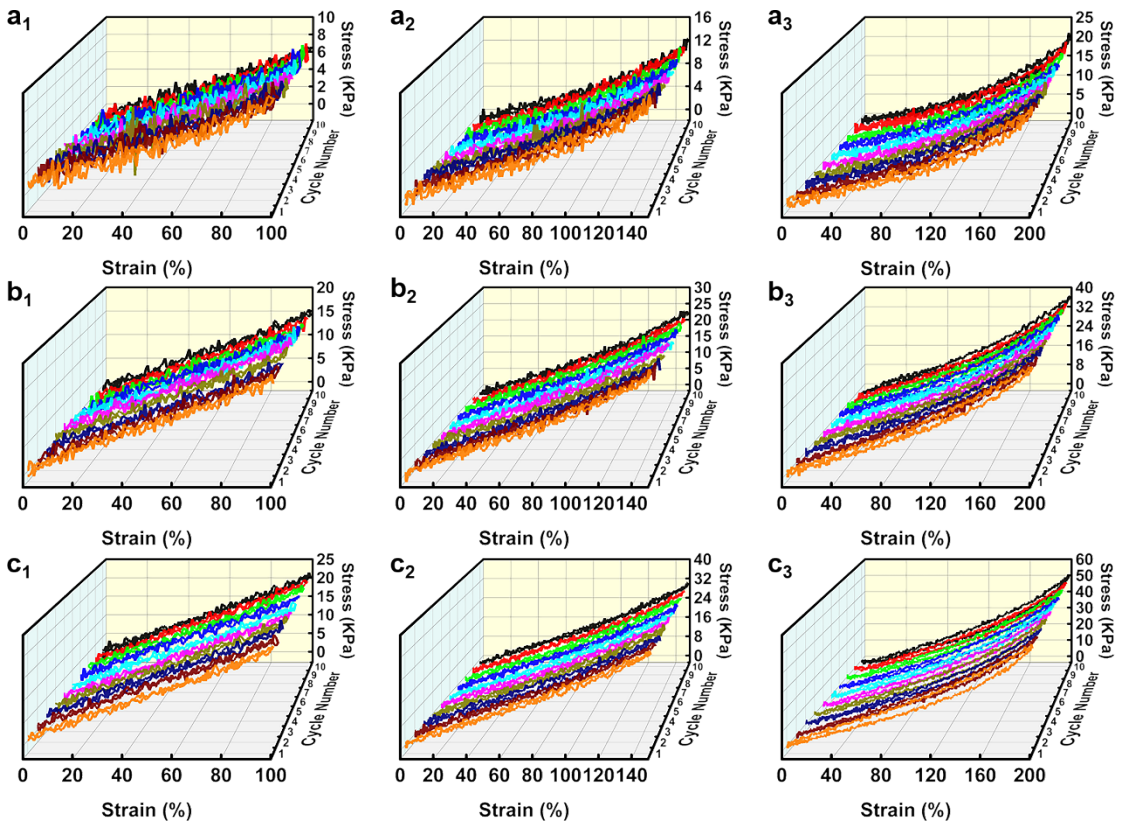
Supplementary Figure S5. (a) Luminescence properties of different component samples. (b) Luminescence properties of samples soaked in different salt solutions. (c) Fluorescence quenching by Fe^{3+}. (d) The QR codes were ionoprinted onto the surface of hydrogels, which can be scanned and accessing to the words "HDD".



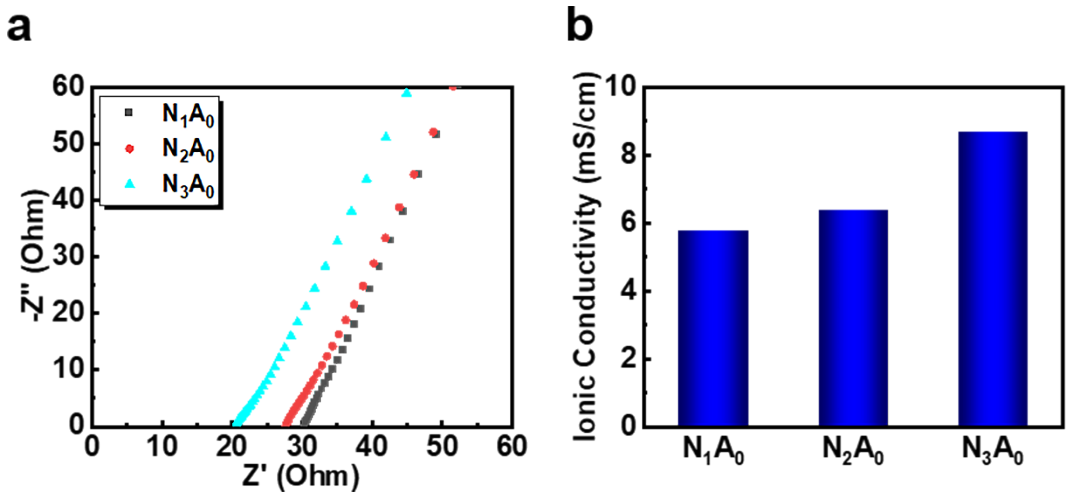
Supplementary Figure S6. (a) Toughness and elastic modulus of N_xA_0. (b) Toughness and elastic modulus of N_xA_1.



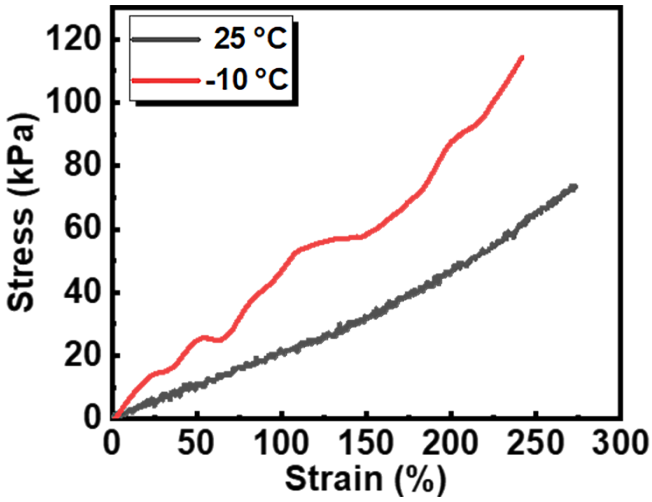
Supplementary Figure S7. The swelling ratio of hydrogels with different ratio of CNPU.



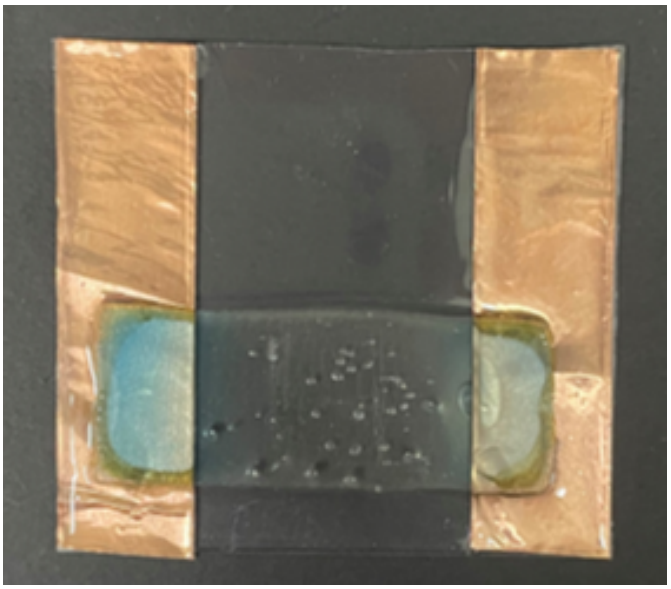
Supplementary Figure S8. ($a_{1,2,3}$), ($b_{1,2,3}$), ($c_{1,2,3}$) Loading-unloading curves of N_1A_1, N_2A_1 and N_3A_1 at different strain.



Supplementary Figure S9. Anti-freezing properties of N_xA_0 hydrogels: (a) Impedance spectra and (b) ionic conductivity of N_3A_0 at varied temperatures.



Supplementary Figure S10. Stress-strain curves of N_3A_1 hydrogel at different temperature.



Supplementary Figure S11. The image of hydrogel-based temperature sensor.