A flexible and fully recyclable transparent conductive organogel based on KI-containing glycerol with excellent anti-freezing and anti-drying behavior

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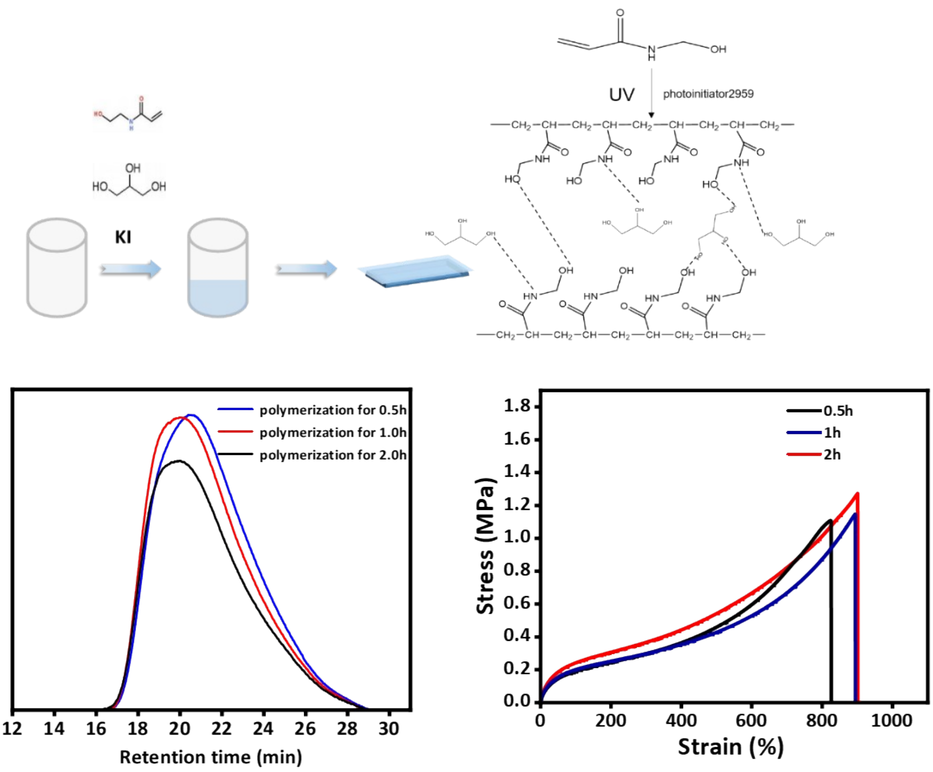


Figure S1 (a)Preparation of HEAA-KI–Gly conductive organoels. (b) GPC profile of PHEAA-KI-Gly organogels with different exposure durations under UV light. H_2O was used as the eluent. (c) The effect of different polymerization times contents on the mechanical properties of the HEAA-KI-Gly organogel.

Table 1 Proportions of different substances in the preparation of the HEAA-KI–Gly organogel.

HEAA	photo-initiator	KI	Glycerol
4.5g	0.045g	0g	0.55g
5.0g	0.05g	0.5g	0.5g
5.25g	0.0525g	1.0g	0.475g
5.5g	0.055g	1.5g	0.45g

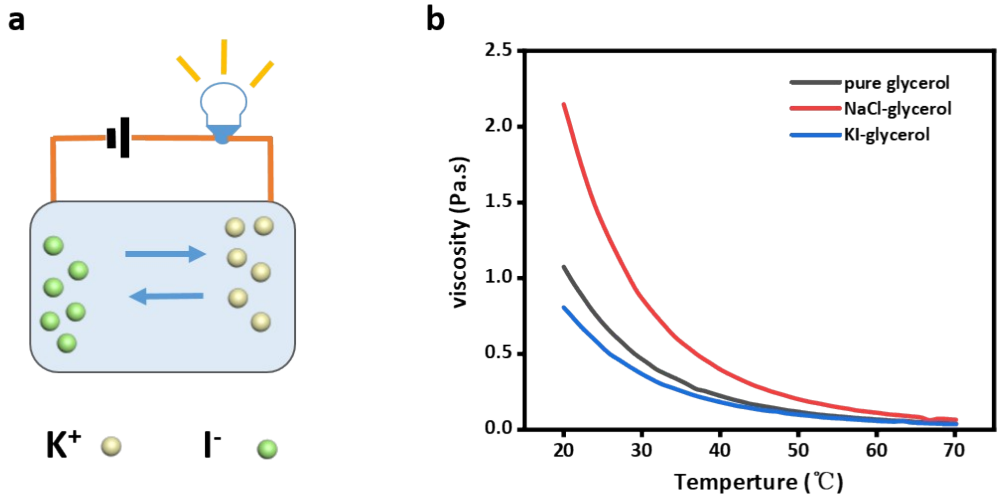


Figure S2 (a) Schematic of the conduction mechanism of the KI-Gly solution, (b) Viscosity variation of glycerol, KI-Gly solution and NaCl-Gly solution at temperatures ranging from 20.0 to 70.0 °C.

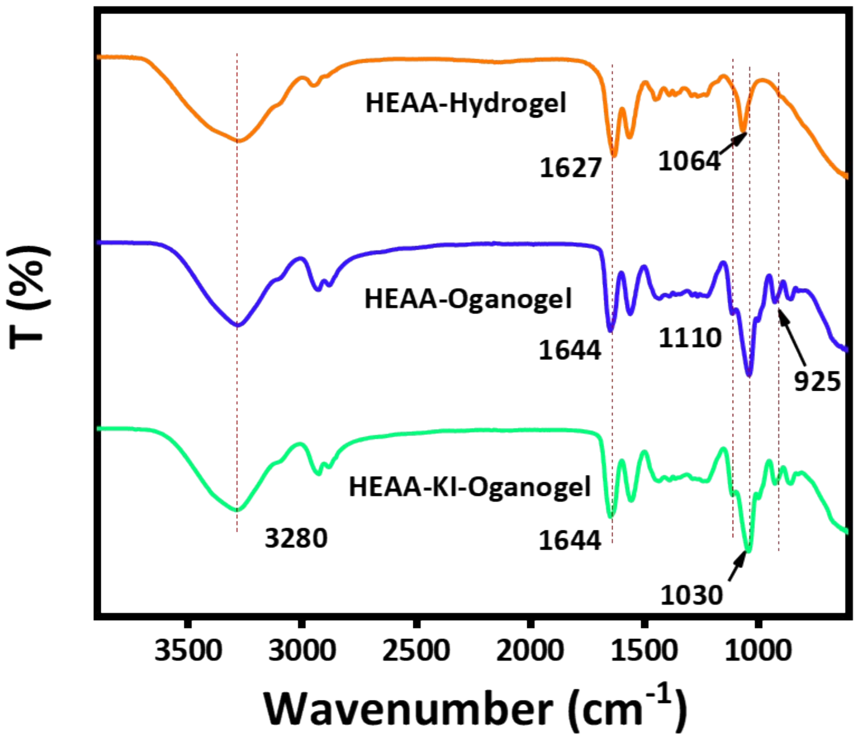
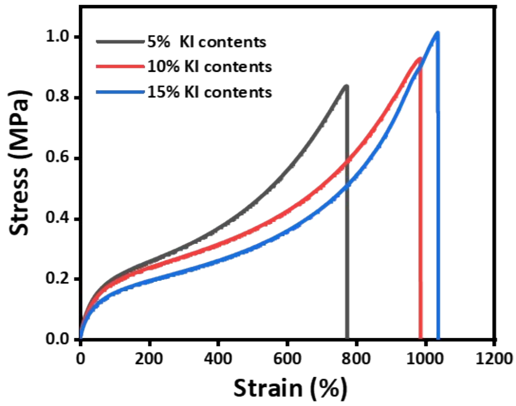
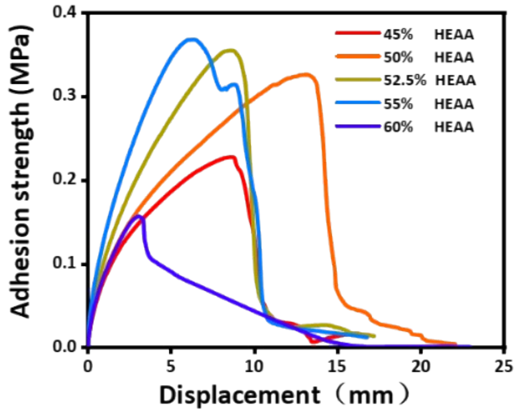


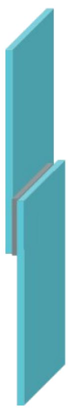
Figure S3 FT-IR spectra of a) HEAA hydrogel, b) HEAA-Gly organogel and c) HEAA-KI-Gly organogel.

a

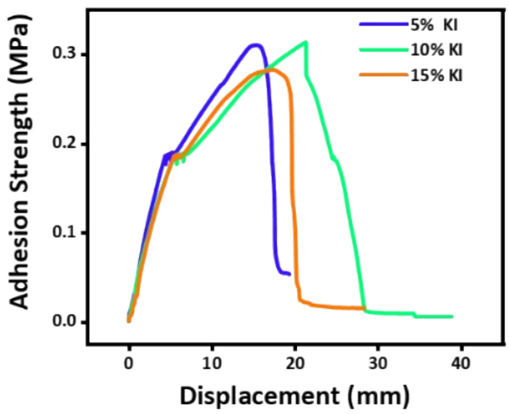

5% KI contents
10% KI contents
15% KI contents
Stress (MPa)
Strain (%)
0.0
0.2
0.4
0.6
0.8
1.0
0
200
400
600
800
1000
1200

b


45%   HEAA
50%   HEAA
52.5% HEAA
55%   HEAA
60%   HEAA
Adhesion strength (MPa)
Displacement （mm）
0.0
0.1
0.2
0.3
0.4
0
5
10
15
20
25



c


5% KI
10% KI
15% KI
Adhesion Strength (MPa)
Displacement (mm)
0.0
0.1
0.2
0.3
0
10
20
30
40

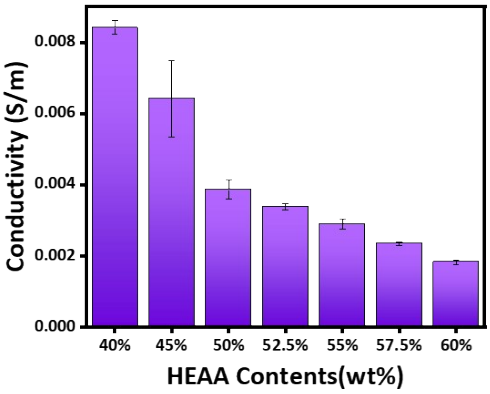


Figure S5 The effect of different HEAA monomer contents on the electrical conductivity of organogels.

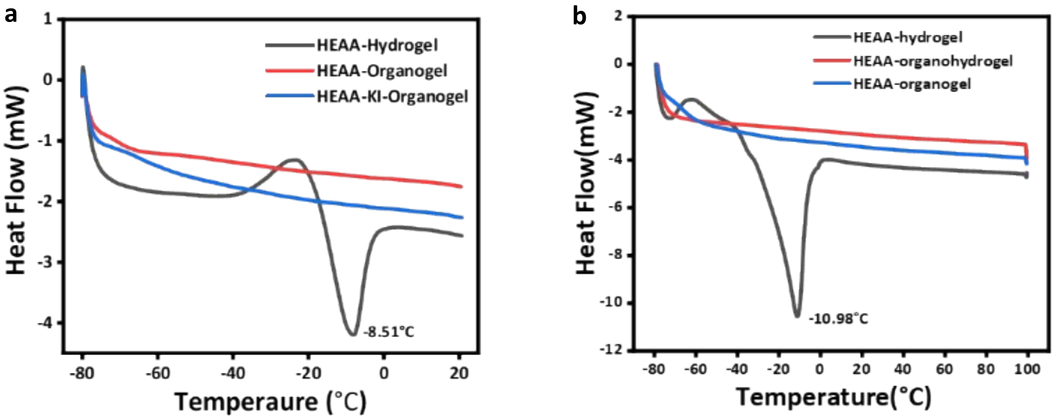


Figure S6 DSC thermograms of HEAA-KI-Gly organogels, HEAA-Gly organogels and HEAA hydrogels.

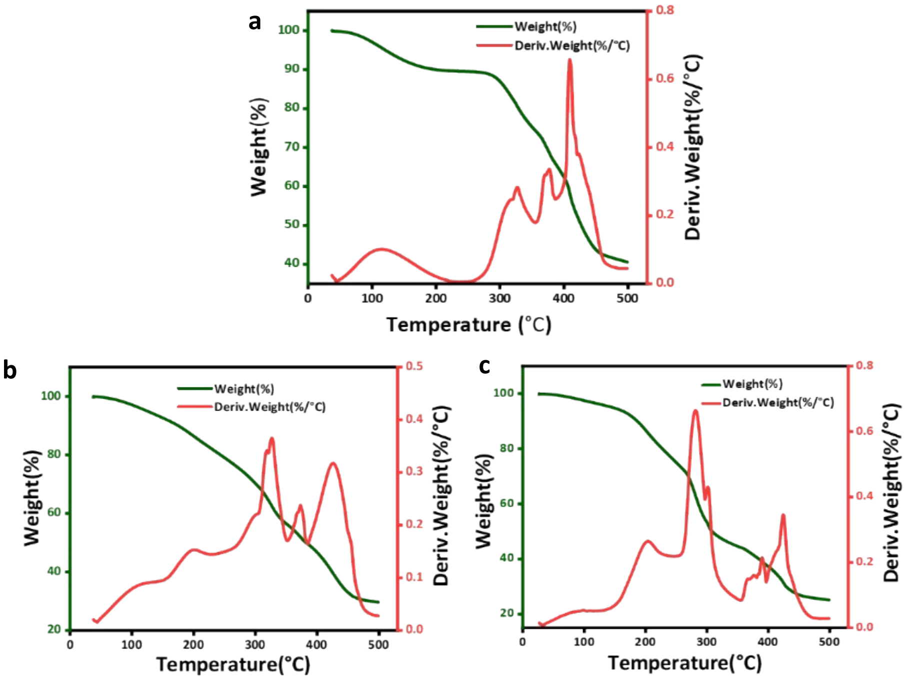


Figure S7 TGA thermograms of (a)HEAA hydrogel, (b)HEAA organohydrogel, and (c)HEAA-Gly organogel

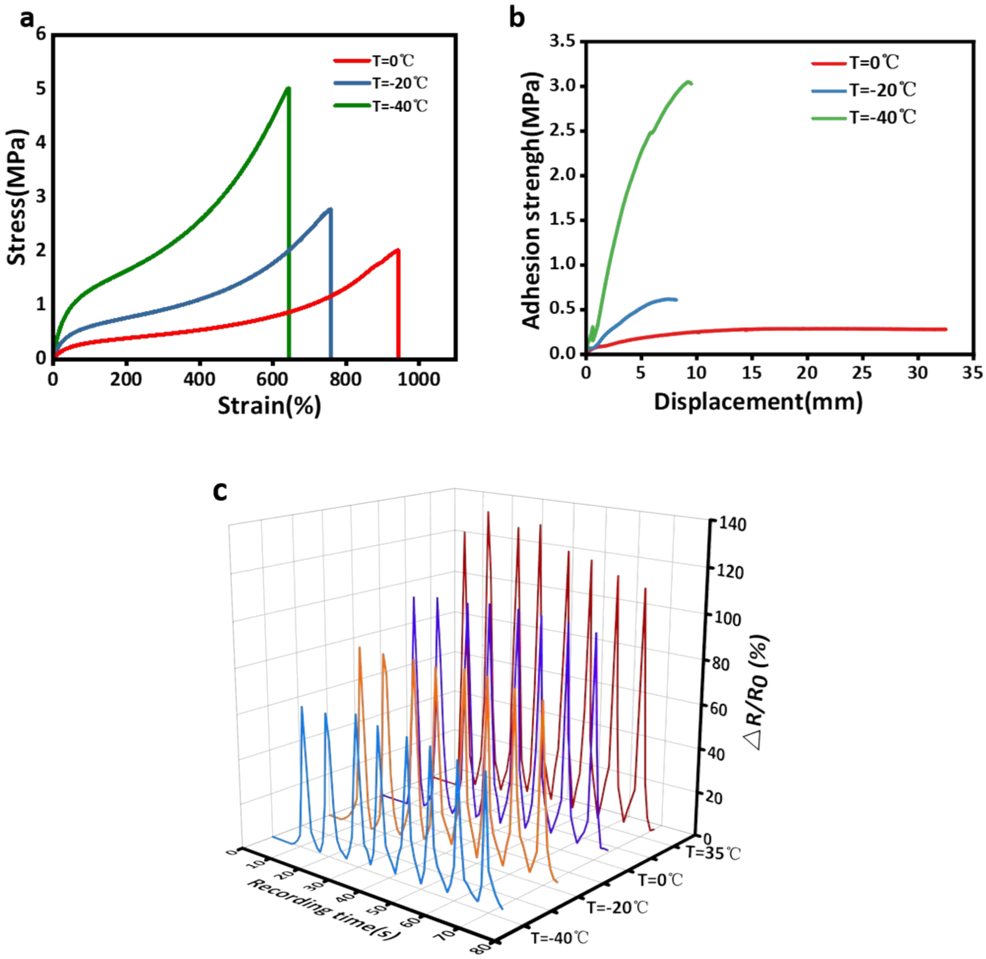


Figure S8 (a) The effect of different temperature contents on the mechanical properties of the HEAA-KI-Gly organogel. (b) Adhesion strength of organogels with different different temperature. (c) Relative resistance changes (△R/R0) at different temperatures under 100% tensile strain

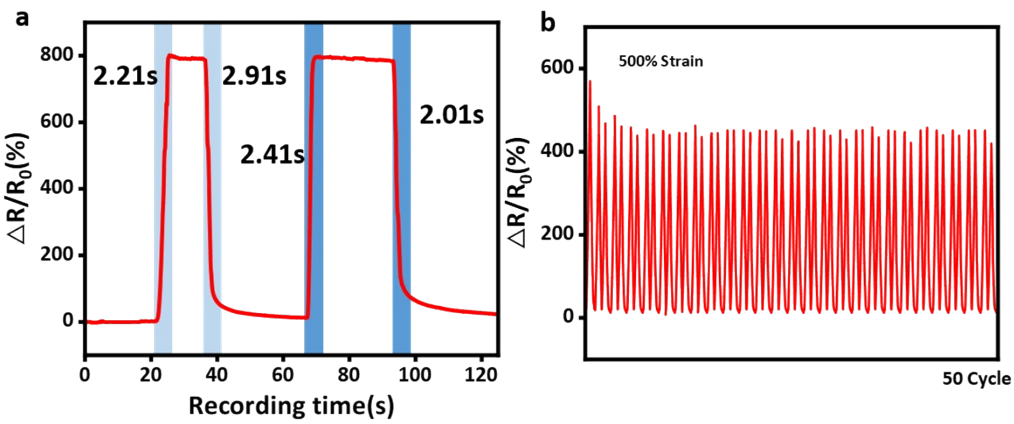


Figure S9 (a) Relative resistance changes (△R/R0) response time of organogels under 800% strain. (b) The durability test under repeated strains of 500% for 50 cycles.

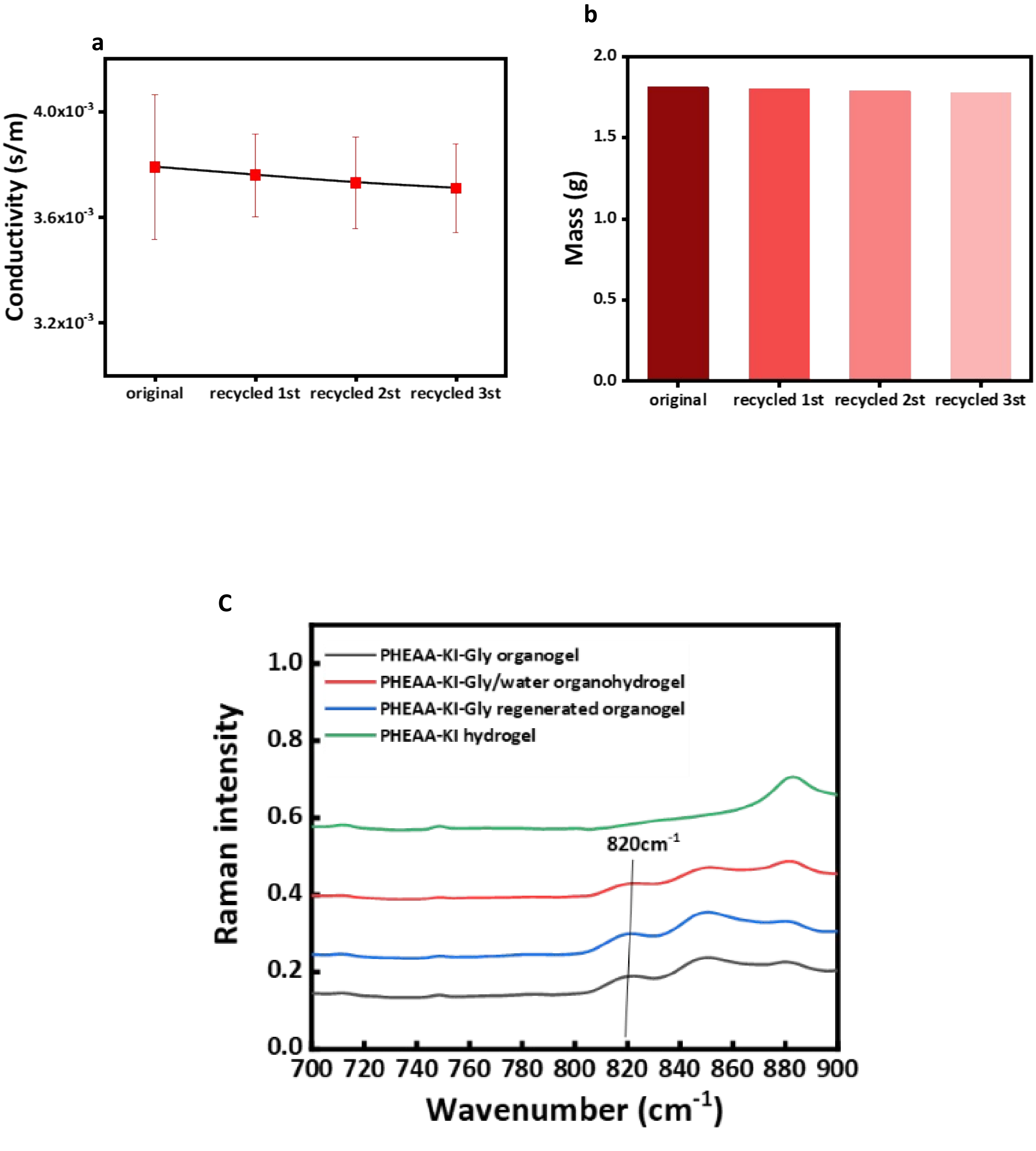


Figure S10 Comparison of quality (a) and conductivity (b) of organic gel films before and after recycling. (c) Raman Spectroscopy of PHEAA-KI-Gly organogel, PHEAA-KI-Gly/water organohydrogel, PHEAA-KI-Gly regenerated organogel and PHEAA-KI hydrogel.

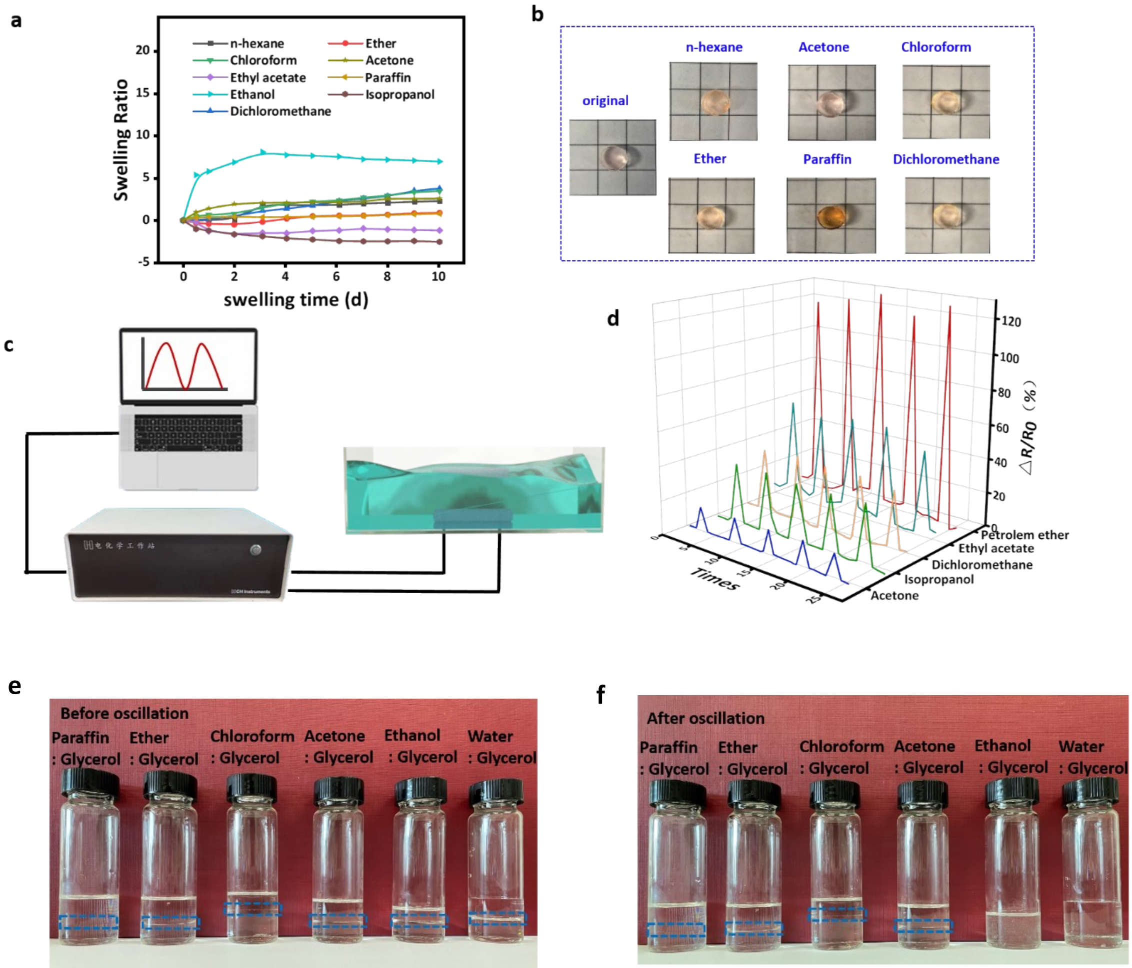


Figure S11 Swelling pictures(a) and swelling ratios(b) of organogel before and after swelling in different low polarity solvents. (c) Illustration of hydrogel sensors applied in solvents. (d) Real-time relative resistance variation of sensors with stretching (under 50% strain) in various solvents. Mutual solubility of solvents with different polarities and glycerol (e)before oscillation and (f) after oscillation

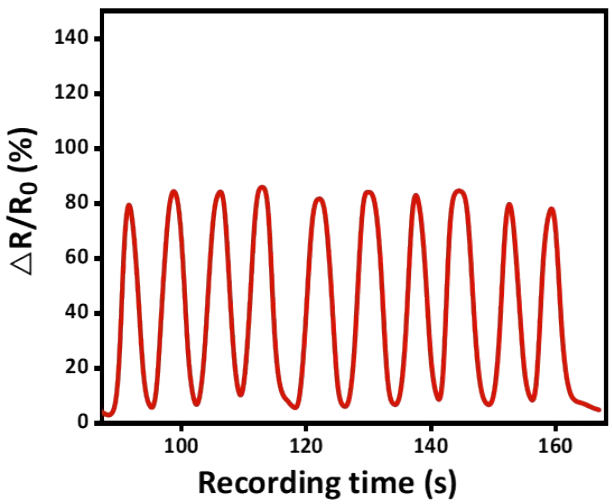


Table 2 Comparison of the performance of glycerol organogels and glycerol water organohydrogels

Materials(G/W organohydrogel)	Temperature range of application	Stretchability	Recyclability	Adhesiveness
PDA-CNTs-PACA[1]	-20℃ to 60℃	600%	no	60KPa
PVA-HEC[2]	-30℃ to 65℃	400%	no	no
PVA-PANi[3]	-20℃	472%	yes	no
PEDOT:PSS-SF[4]	-40 ℃ to 60 ℃	100%	no	no
P(AM-MAANa-DMC)[5]	-20℃	1500%	no	no
PDMAPS-SA[6]	-25℃ to 25℃	50%	no	no
PAA-CNF[7]	-46℃	980%	no	25KPa
P(SBMA-HEAA)[8]	-30℃ to 60℃	600%	no	21KPa
This work	-60℃ to 70℃	1200%	yes	300KPa

Notes and references

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