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

Supporting Information

An integrated transparent, UV-filtering organohydrogel sensor via molecular-level ion conductive channels

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Figure S7. EMG signals detected by a commercial Ag/AgCl electrode.

Figure S8. The T-pen can still control a smartphone after pressing or sliding the screen 10000 times.

Figure S9. The T-pen can operate the smartphone at -30℃.

Movie S1. The PVA-TA@talc organohydrogel can withstand multiple extrusions from a sport utility vehicle (SUV) weighing 1.7 tons without sustaining any damage.

Movie S2. The T-pen consisting of the PVA-1 organohydrogel and fine iron rods is able to act as a substitute for a finger and can slide and press the phone screen.

Table S1. Compositions of the ionic conductive supramolecular PVA-TA@talc organohydrogels.

Code	TA@talc (ml)	H_2O (ml)	EG (ml)	Anhydrous aluminum chloride (g)	PVA (g)
PVA-0	0	10	10	0.2667	3.5294
PVA-1	2.5	7.5	10	0.2667	3.5294
PVA-2	5	5	10	0.2667	3.5294
PVA-3	7.5	2.5	10	0.2667	3.5294
PVA-4	10	0	10	0.2667	3.5294

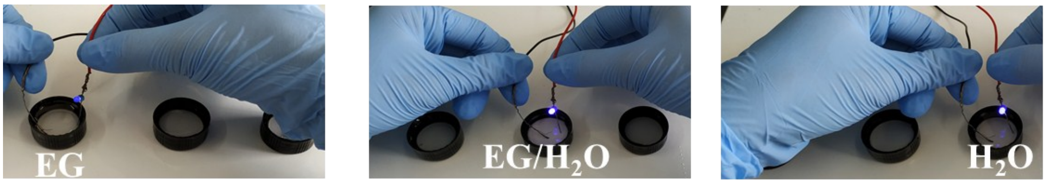

Figure S1. Conductivity of different solvents after adding aluminum chloride.

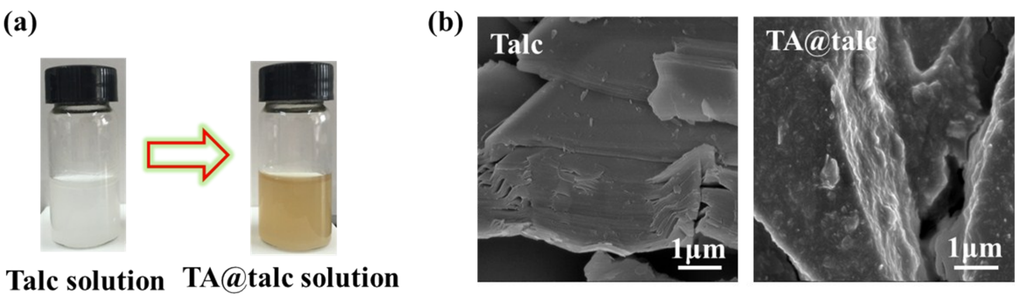

Figure S2. (a) Color of the talc and TA@talc suspension. (b) SEM images of the morphology of the TA and TA@talc particles.

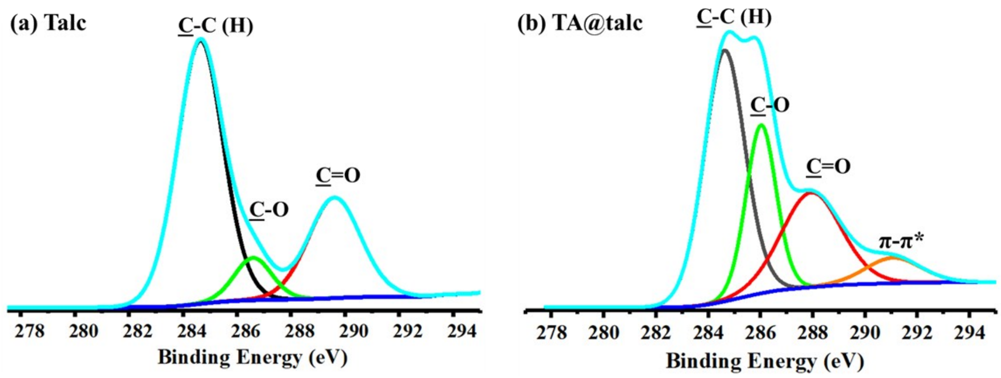

Figure S3. High-resolution XPS spectra of C 1s for dried (a) talc particles and (b) TA@talc particles.

Table S2. Statistical results of the Gauss-fitted peak compositions of the dried talc and TA@talc particles.

Functional groups	Binding energy (eV)	Talc (%)	TA@talc (%)
C-C (H)	284.61	21.05	21.39
C-O	286.01	2.76	10.58
C=O	～288.5	9.18	11.8
π-π*	291.06	一	2.96

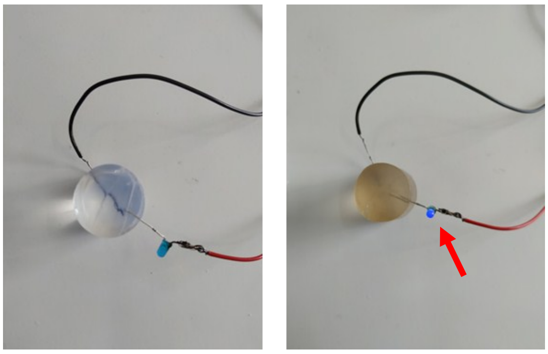

Figure S4. The nonconductive pure PVA organohydrogel (PVA-0) and the conductive PVA-TA@talc organohydrogel (PVA-4).

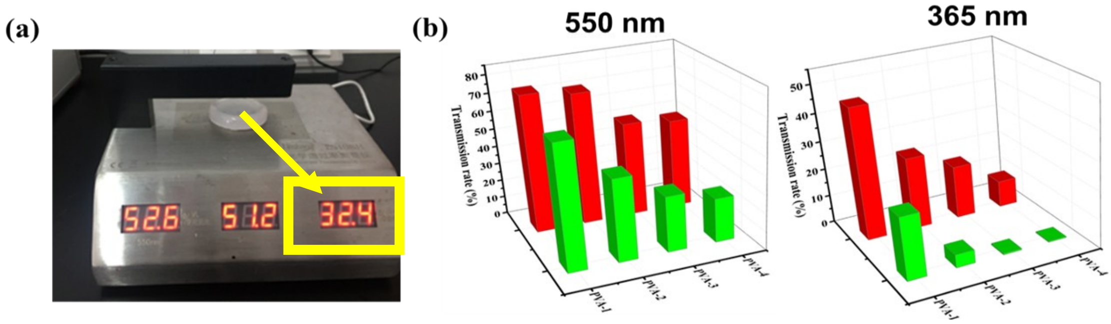

Figure S5. (a) The shielding efficiency of the 10-mm-thick PVA-talc-2 organohydrogel (without TA) to ultraviolet light (365 nm). (b)Transmittance of the organohydrogels with different thicknesses and TA @talc contents for visible light (550 nm) and UV light (365 nm). Red bars represent the test results of organohydrogels with a 3 mm thickness, and green bars represent the test results of organohydrogels with a 10 mm thickness. (The gel corresponds to the PVA-TA@talc organohydrogel without ions.)

The talc itself has a UV-reflecting function. In our work, TA has been oxidized into polymerized p-TA. Therefore, we think that the simple addition of TA powder may differ from the actual results. To this end, we prepared the PVA-talc-2 organohydrogel (without TA), this PVA-talc-2 organohydrogel has good UV shielding effect (Figure S5a), but much lower than the PVA-2 organohydrogel (with TA). Therefore, it should be that talc and TA work together to impart excellent UV shielding ability to the organohydrogel.

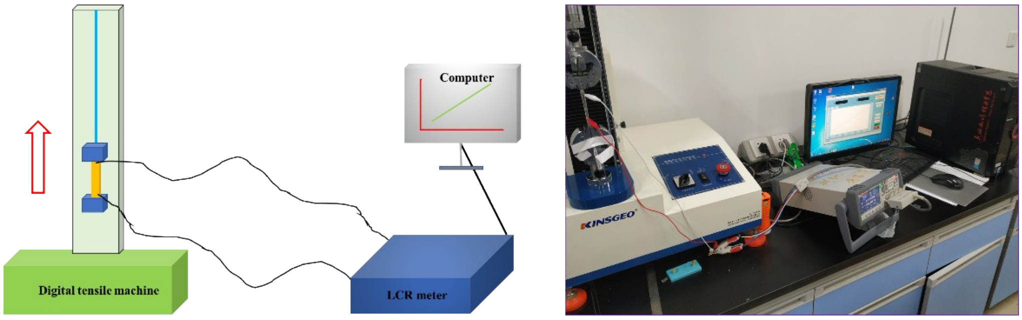

Figure S6. The gauge factor (S) measurement approach.

Table S3. Gauge factor (S) comparisons between the organohydrogel (PVA-1) sensor and recently reported ionic gel-based sensors.

Base gel	Conductive filler	Gauge factor (tensile strain)	Ref
PAA	Al^{3+}	0.23(40%), 7.8(2000%)	38
PAAm	Li^{+}	0.84 (40%)	50
PAA	Graphene/ Fe^{3+}	1.32(500%)	51
HPAAm-HLPs/alginate	Ca^{2+}	2.67(150%)	52
PVA/ Polyvinylpyrrolidone	Fe^{3+}	0.478(200%)	53
PVA	Al^{3+}	9.17 (1.2%)	This work

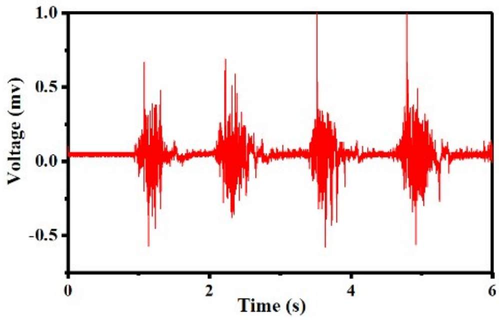

Figure S7. EMG signals detected by a commercial Ag/AgCl electrode.

In order to complete the durability test of the T-pen, two volunteers used the T-pen to manually complete the following operations: (1) The T-pen slides the screen of the mobile phone 10000 times. (2) The T-pen presses the screen 10000 times. The condition of the T-pen operating the mobile phone were analyzed.

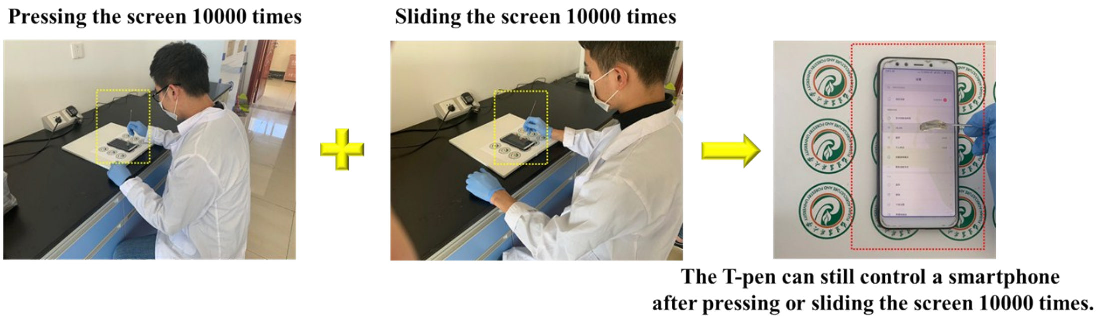

Figure S8. The T-pen can still control a smartphone after pressing or sliding the screen 10000 times.

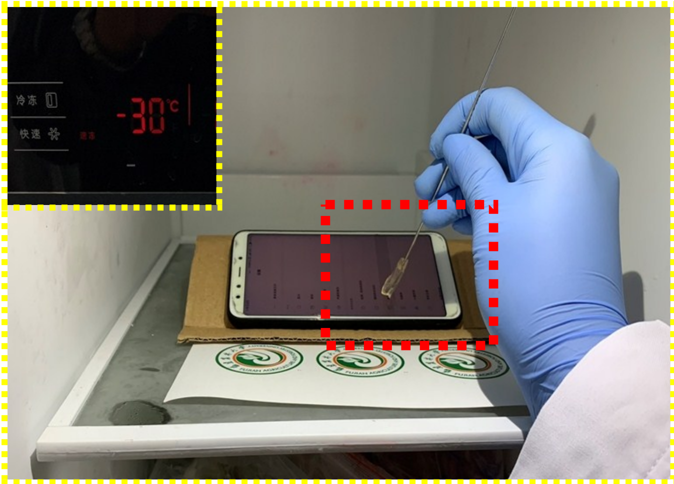

Figure S9. The T-pen can operate the smartphone at -30℃.