A robust and adhesive anti-swelling hydrophobic ionogel with prolonged stability for strain and temperature sensors

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Samples	MEA (wt.%)	A-CNCs (wt.%)	Soaking Time (day)
MC_0	23	0	0
MC_1	23	1	0
MC_2	23	2	0
MC_0S	23	0	7
MC_1S	23	1	7
MC_2S	23	2	7

Table S1 The composition of the MC_X and MC_XS ionogels

Materials	Gauge Factor	Response time (ms)	Applications/Underwater application	Reference
MCS ionogels	1.189	60	Strain and temperature sensors/Yes	This Work
Ti ₃ C ₂ T _x MXene/AgNWs/ LM composite materials	3	/	Flexible strain sensors/No	Ref 1
(nanosilver/SEBS) m conductive nanomaterials	0.611	/	Artificial muscles; electromagnetic shielding; reconfigurable antennas/No	Ref 2
PP/SWCNT/PVP composite foam	0.16	/	Electromagnetic shielding and electrothermal tumor ablation/No	Ref 3
PDMSOH1- DTB _{0.5} /AgNWs elastic conductor	3.33	/	Conducting electrode/No	Ref 4
PAAm-oxCNTs hydrogels PVA-SA	1.5	300	Flexible strain sensors/No Flexible	Ref 5
composite eutectic gels	2.01	/	wearable sensors and supercapacitors/No	Ref 6

Table S2 The functionality of this work in comparison with other flexible sensors



Fig. S1. Hydrophobic aggregation schematic diagram of polymers after soaking treatment.



Fig. S2. Hydrophobic aggregation schematic diagram of polymers after soaking treatment.



Fig. S3. The swelling behavior of MC_1 ionogels in artificial seawater and PBS solution.



Fig. S4. The comparison of weight retention rate before and after 4 months' storage.



Fig. S5. (a)The toughness and (b) the elongation at break of different ionogels.



Fig. S6. (a) Continuous loading-unloading tests with tensile strain ranging from 100% to 600%. (b) Cyclic tensile curves of MC₁S ionogel at 600% strain for five cycles.



Fig. S7. Consistent adhesive performance of the ionogel tested on rubber as the substrate.



Fig. S8. Adhesive strength of the MC₁S ionogel to rubber at various external temperatures.



Fig. S9. Long-term adhesive strength of the MC₁S ionogel to rubber after 3 months of underwater storage.



Fig. S10. The stability of the ionogel sensor.



Fig. S11. The relative resistance changes of the MC_1S ionogel temperature sensors at -40 °C.

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