Electronic Supplementary Information for

Ultra-stretchable Ion Gels Based on Physically Cross-linked Polymer Networks

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Table S1. Feed ratio of P(EA-*co*-AA).

Sample	AIBN (mg)	EA (g)	AA (g)	Dioxane (mL)
P(EA-*co*-AA)-1	10.0	5.25	0.540	12
P(EA-*co*-AA)-2	10.0	5.00	0.720	12
P(EA-*co*-AA)-3	10.0	4.50	1.08	12
P(EA-*co*-AA)-4	10.0	4.00	1.44	12
P(EA-*co*-AA)-5	10.0	3.00	2.16	12
P(EA-*co*-AA)-6	10.0	2.00	2.88	12

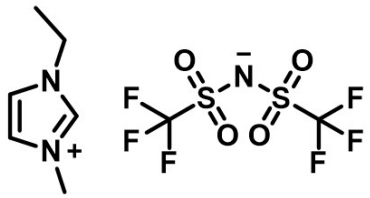
Table S2. Sample composition and tensile properties of different P(EA-*co*-AA-*co*-AANa) ion gels.

Sample [a)]	Polymer [b)]	NaOH (mg)	EA (mol%)	AA (mol%)	AANa (mol%)	Stress (kPa)	Strain (%)
78-22-0	P(EA-*co*-AA)-3	0.00	78	22	0	-	-
78-19-3	P(EA-*co*-AA)-3	5.00	78	19	3	-	-
78-16-6	P(EA-*co*-AA)-3	10.0	78	16	6	60	> 6500
78-10-12	P(EA-*co*-AA)-3	20.0	78	10	12	980	2600
78-5-17	P(EA-*co*-AA)-3	30.0	78	5	17	1100	790
78-0-22	P(EA-*co*-AA)-3	40.0	78	0	22	1270	470
88-0-12	P(EA-*co*-AA)-1	20.0	88	0	12	180	2700
85-3-12	P(EA-*co*-AA)-2	20.0	85	3	12	740	2500
70-18-12	P(EA-*co*-AA)-4	20.0	70	18	12	2600	910
52-36-12	P(EA-*co*-AA)-5	20.0	52	36	12	-	-
38-50-12	P(EA-*co*-AA)-6	20.0	38	50	12	-	-

[a)] Named based on the mole percentages of the three monomers, [b)] 400 mg of polymer in each sample.

Table S3. Parameters for the VTF fitting of the conductivity data

σ_0 (S cm^{-1})	E_a (kJ mol^{-1})	T_0 (K)
0.086	2.04	157



Scheme S1. Chemcial structure of [EMIM][TFSI].

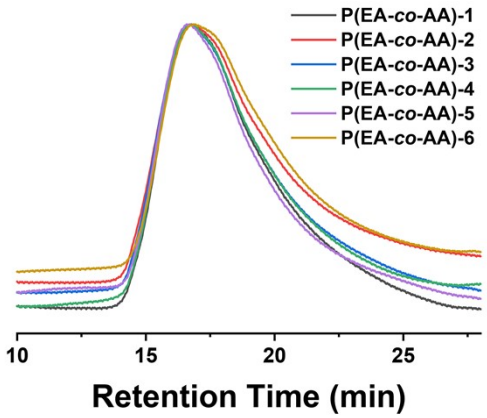


Figure S1. GPC curves of P(EA-*co*-AA).

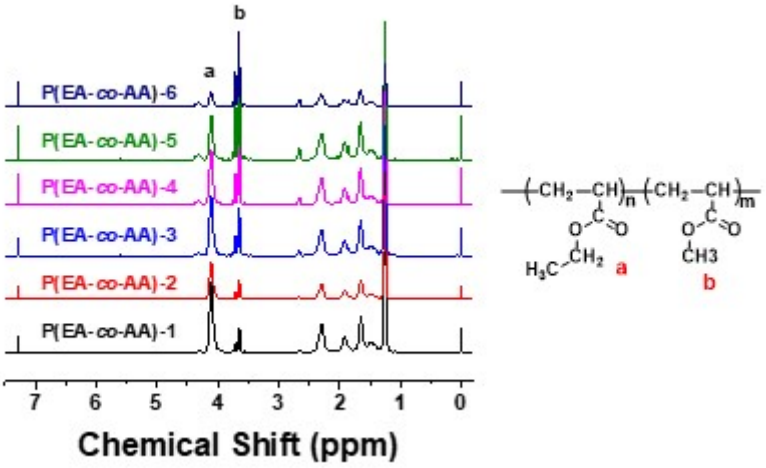


Figure S2. ^{1}H NMR spectra of P(EA-*co*-AA) samples with $CDCl_3$ as the solvent.

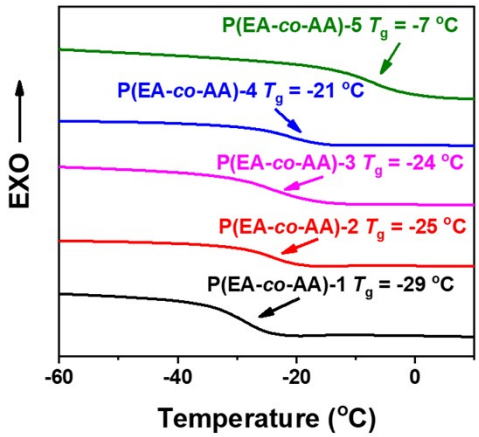


Figure S3. DSC thermograms of P(EA-*co*-AA) with different EA/AA ratios.

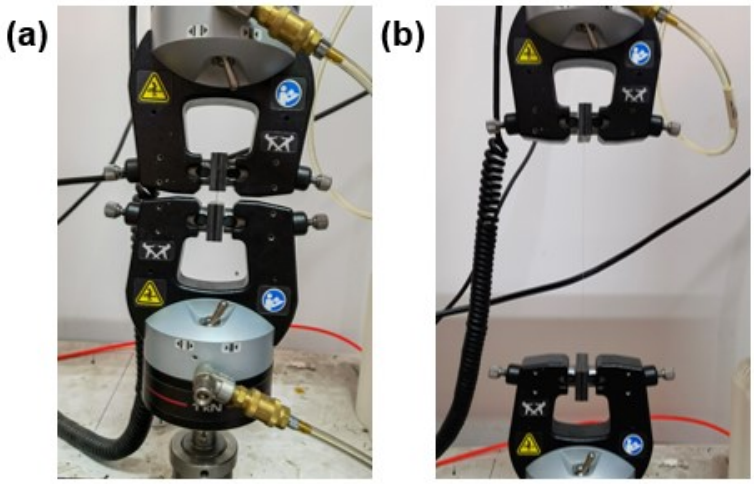


Figure S4. Photographs of the P(EA-*co*-AA-*co*-AANa) ion gel before (a) and after (b) stretching.

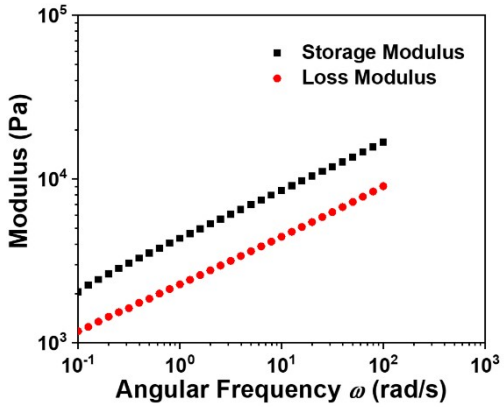


Figure S5. Storage and loss moduli of the ion gel from sample 78-16-6.

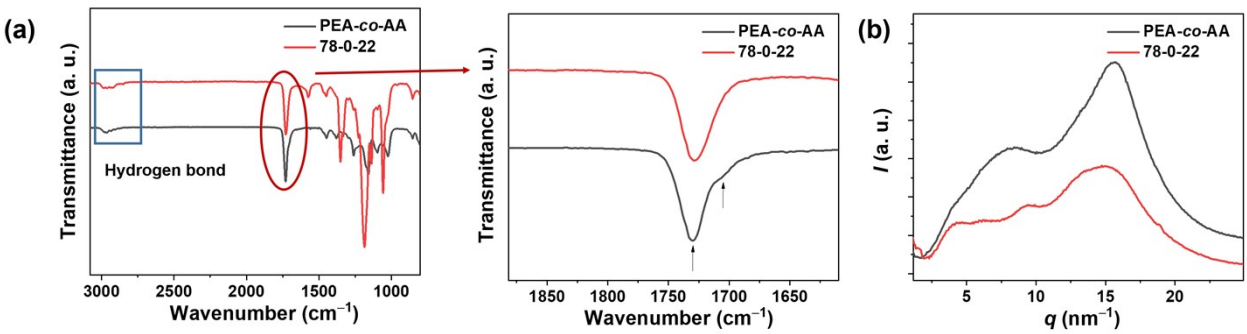


Figure S6. FTIR (a) and WAXS (b) results of PEA-*co*-AA and 78-0-22.

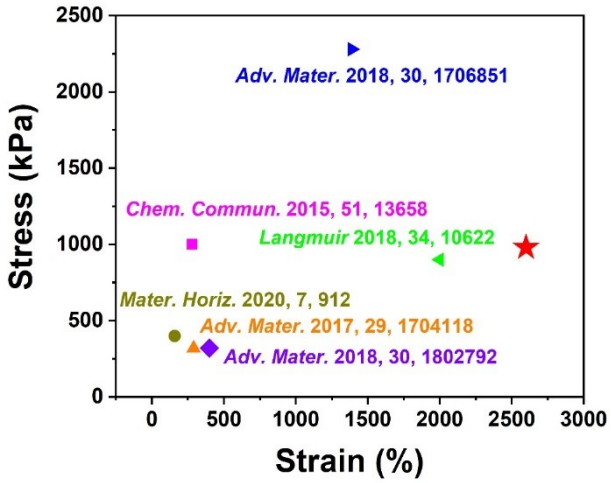


Figure S7. Breaking elongation and failure tensile stress of high-performance ion gels reported in recent years.[1-6] The red star indicates ion gel from sample 78-10-12 in this work.

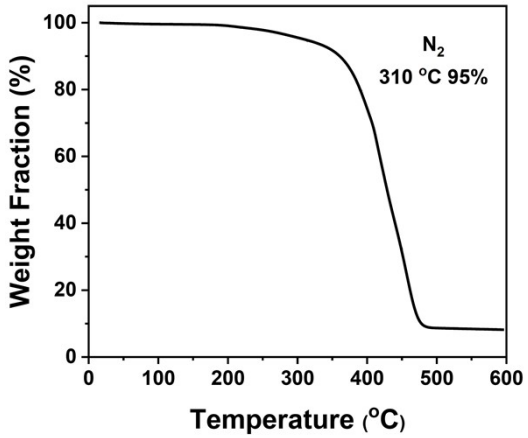


Figure S8. Thermogravimetric curve of the P(EA-*co*-AA-*co*-AANa) ion gel (78-10-12) at a heating rate of 10 °C min^{-1} under nitrogen.

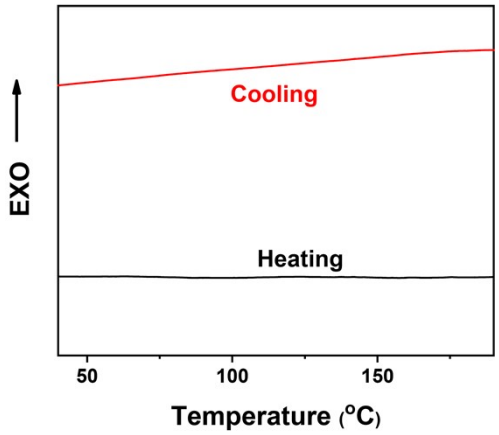


Figure S9. DSC thermogram of the P(EA-*co*-AA-*co*-AANa) ion gel at a heating and cooling rate of 20 °C min^{-1} under a nitrogen atmosphere.

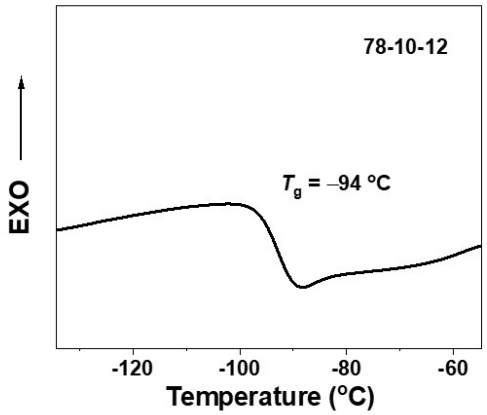


Figure S10. DSC thermogram of the ion gel from sample 78-10-12 at a heating and cooling rate of 20 °C min^{-1} under a nitrogen atmosphere.

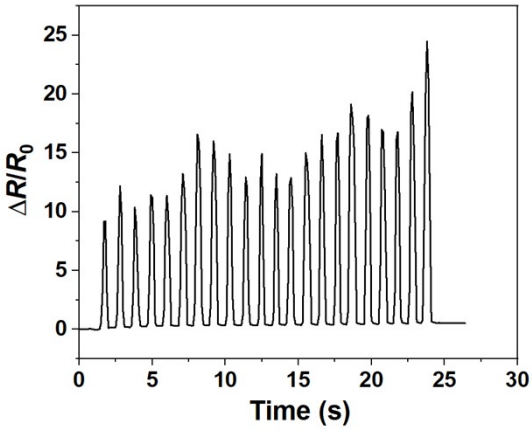


Figure S11. Sensing performance of the strain sensor in large strains.

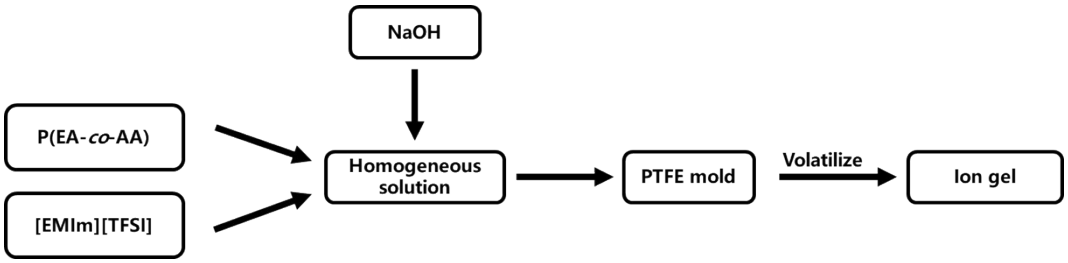


Figure S12. Schematic illustration of the preparation of the P(EA-*co*-AA-*co*-AANa) ion gel.

References

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