Electronic Supplementary Information

Solid polymer electrolytes reinforced with porous polypropylene separators for all-solid-state supercapacitors

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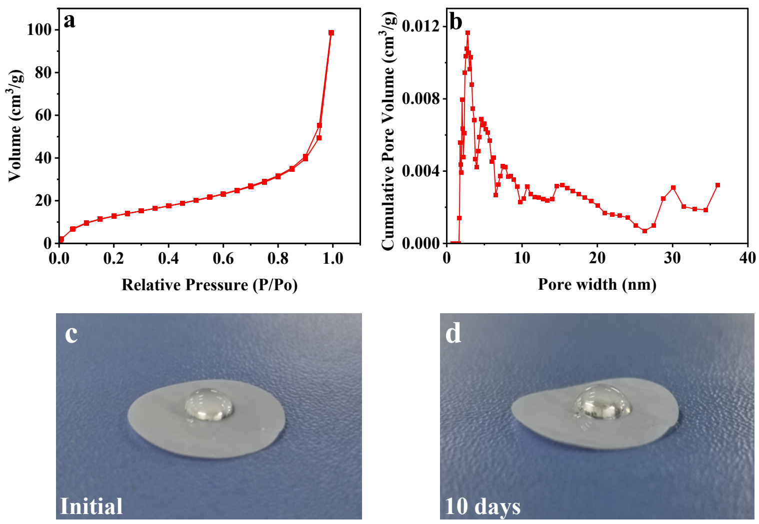

Fig. S1 Adsorption-desorption isotherms of PP separator (a) and corresponding pore size distribution (b); Initial state (c) and state after 10 days (d) of IL drop on PP separator.

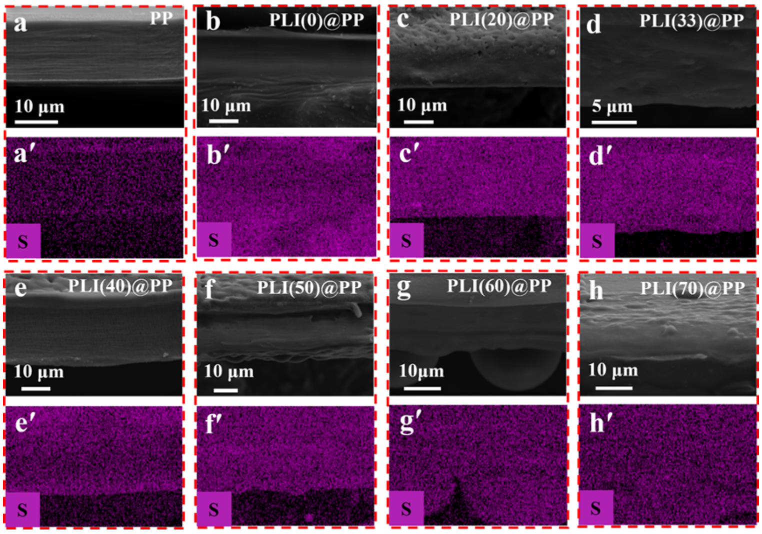

Fig. S2 PLI(x)@PP cross-section SEM images (a-h) and element sulfur (S) distribution EDS images (a'-h')

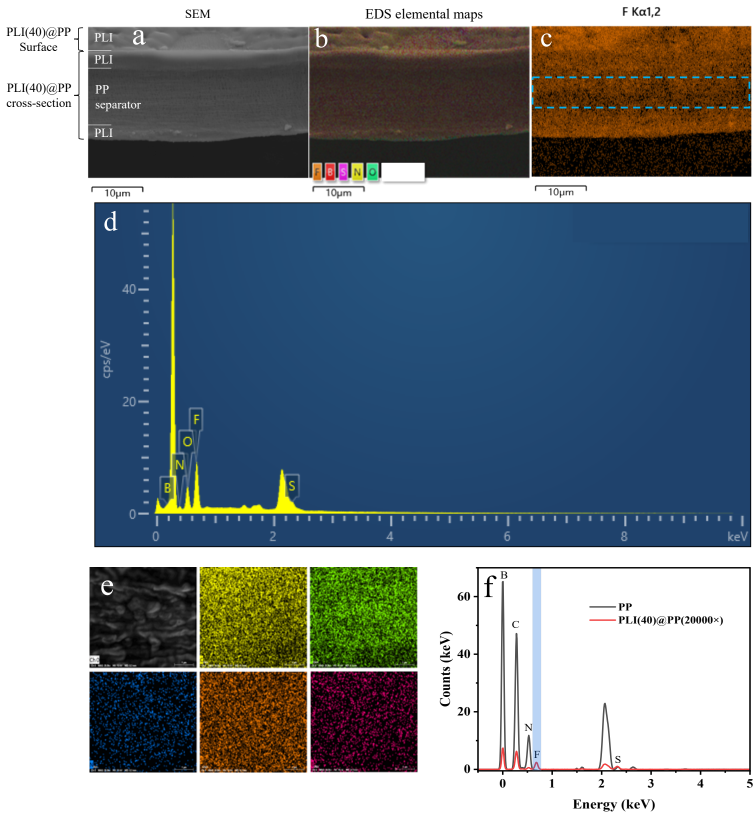

Fig. S3 PLI(40)@PP cross-section SEM images (a), element distribution EDS images (b) and energy spectrum distribution map (c) EDS elemental maps of F, (d) EDS spectra of N, B, F, O and S elements, and (e-f) EDS test of the internal PP separator of PLI(40)@PP cross-section and PP.

Table S1 Melting temperature (Tm), melting enthalpy (ΔH), and crystallinity (Xc) of PEO and PLI(x).

Sample	T_m **(°C)**	ΔH **(J g^{-1})**	X_c **(%)**
PEO	70.9	163.7	76.6
PLI(0)	57.3	66.0	30.9
PLI(20)	52.6	49.0	22.9
PLI(33)	49.2	38.6	18.1
PLI(40)	49.0	37.4	17.5
PLI(50)	45.7	34.5	16.1
PLI(60)	44.8	25.8	12.1
PLI(70)	43.1	21.6	10.1

Table S2 Comparison of specific capacitance between supercapacitors in this paper and other supercapacitors using all solid-state polymer electrolytes.

Electrode	**Electrolyte**	C_{sp}**/F g^{-1}**	**Ref.**
AC	PEO/FPC /IL	70.8	[S1]
AC/GR	PEO/PPO/IL	112.3	[S2]
AC	PEO/NaI/IL	95	[S3]
AC + MWCNT	PVDF-HFP /[PMpyr][NTf$_2$]	156.6	[S4]
AC	PVDF-HFP /IL/KI	100	[S5]
AC	PLI (70)@PP	158	This work

poly(VA-co-AN): poly(vinyl alcohol-co-acrylonitrile), FPC: non-woven cellulose separator, GR: Graphene, PPO: poly(propylene oxide), PVDF-HFP: Poly(vinylidene fluoride-co-hexafluoropropylene) polymer, PVA: poly(vinyl alcohol)

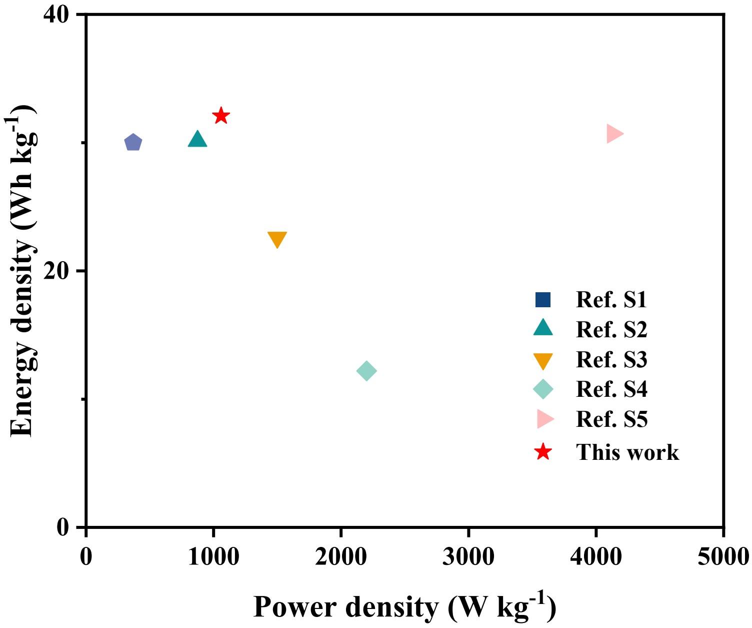

Fig. S4 Ragone plot of the CE/PLI(70)@PP/CE and literature data.

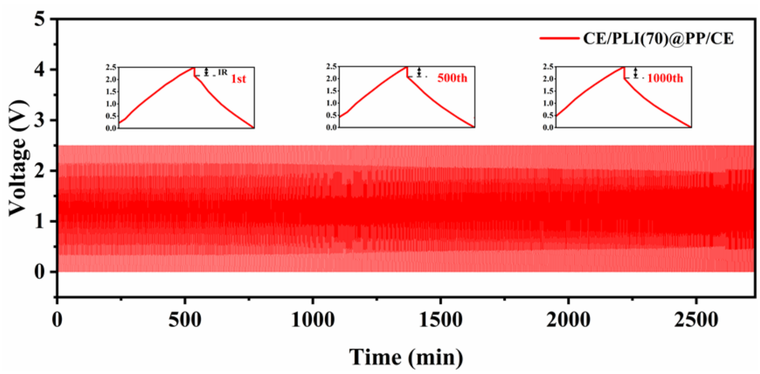

Fig. S5 One thousand charge–discharge cycles of the CE/PLI(70)@PP/CE at a 1 A g^{-1} current density.

Fig. S6 (a) EIS curves of CE/PLI(70)@PP/CE and CE/PLI(70)/CE before and after cycling; (b) the EDS test of the internal PP separator of PLI(70)@PP cross-section before cycling and after 1000 cycles.

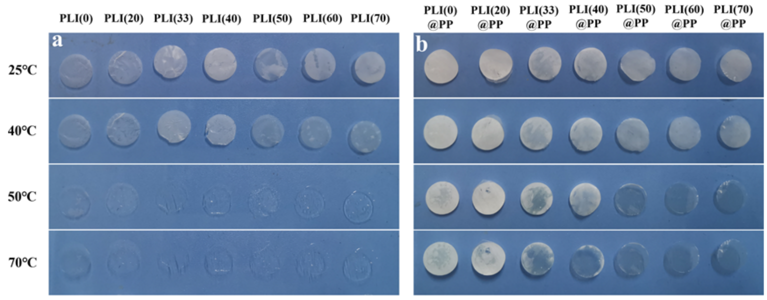

Fig. S7 Images of PLI (x) (a) and PLI (x)@PP (b) after dimensional stability test at different temperatures (25-70℃).

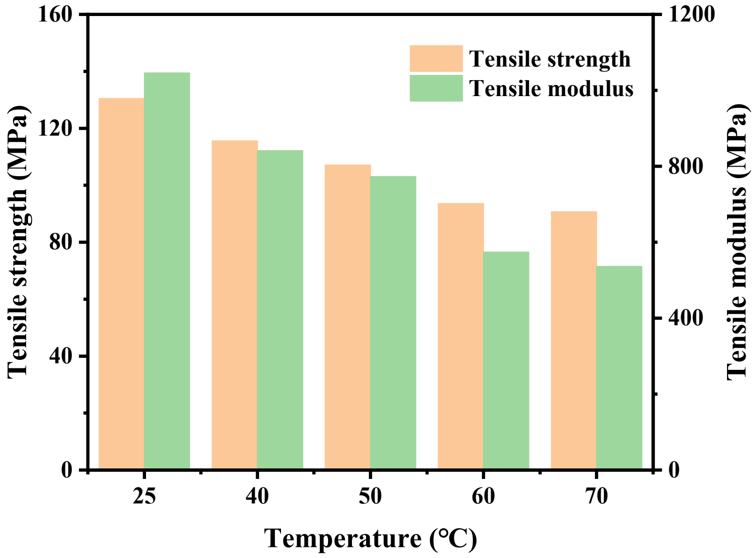

Fig. S8 The tensile strength and modulus of PLI(70)@PP at 25-70°C.

Reference

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