

Electronic Supporting Information: ESI

Utilizing $\text{Li}_4\text{Ti}_5\text{O}_{12}$ as Multifunctional Filler of Composite Solid

Electrolyte for All-Solid-State Lithium Metal Battery

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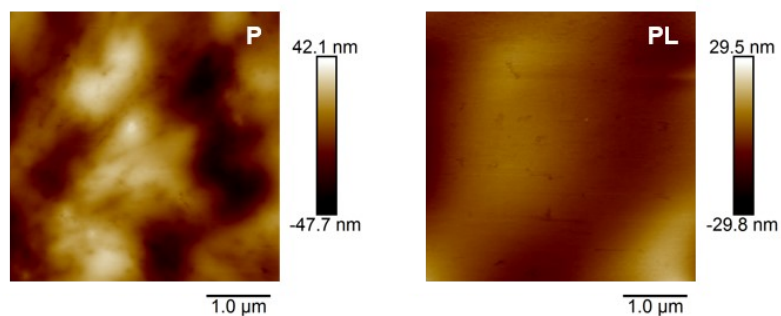


Fig. S1 AFM surface topographies of P and PL membrane.

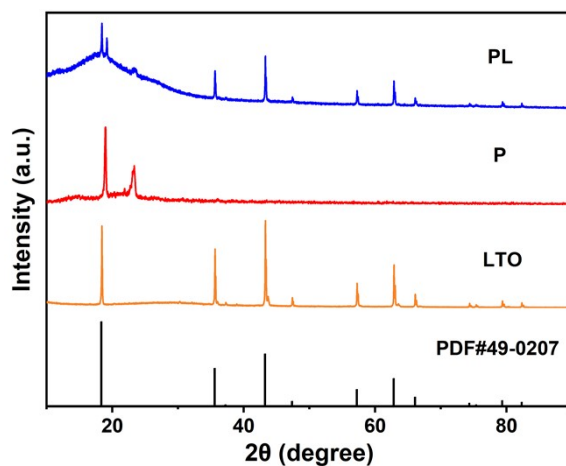


Fig. S2 XRD spectra of P and PL membrane.

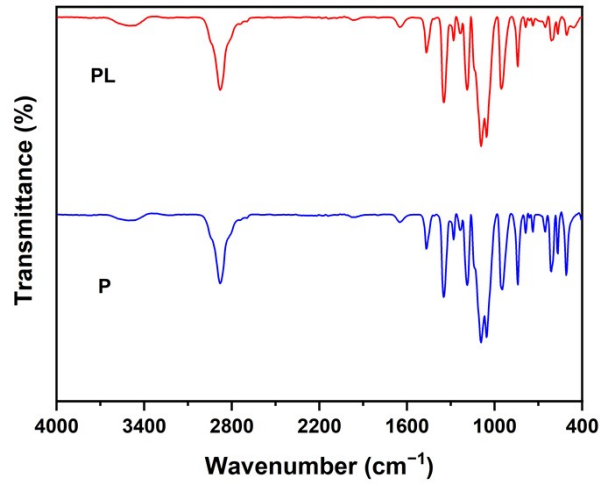


Fig. S3 FTIR spectra of P and PL membrane.

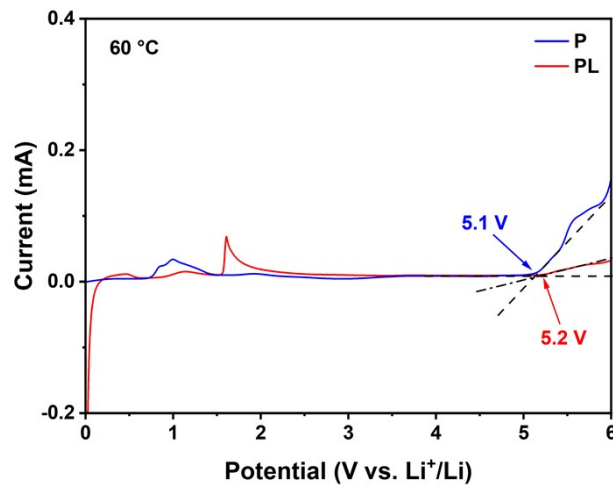


Fig. S4 LSV curve of P and PL membrane.

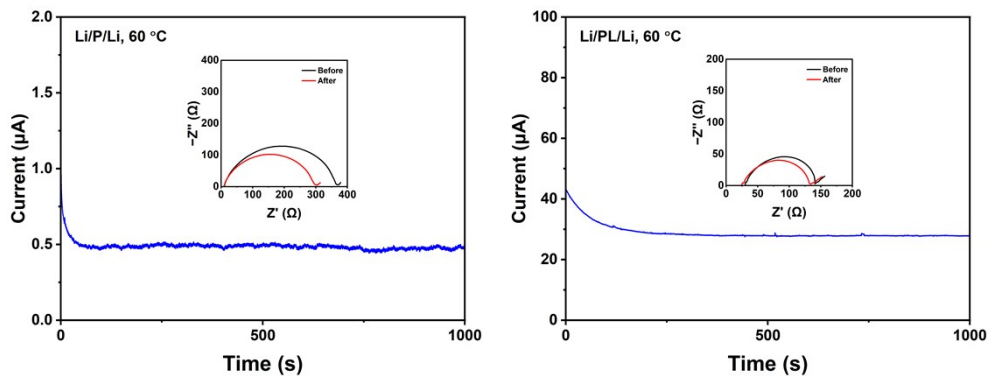


Fig. S5 Li^+ transference number of P and PL membrane.

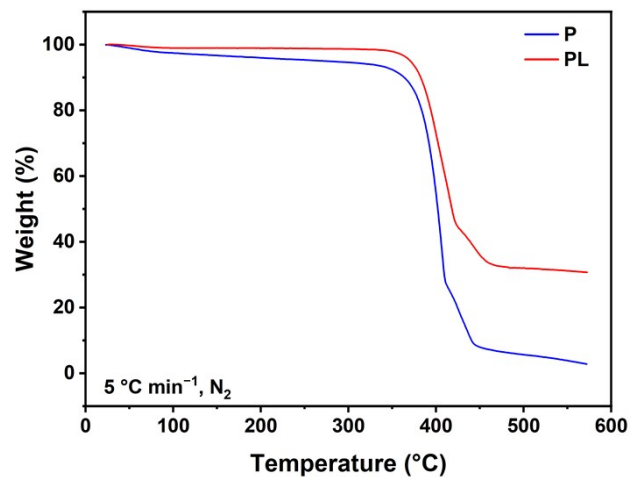


Fig. S6 TG curve of P and PL membrane.

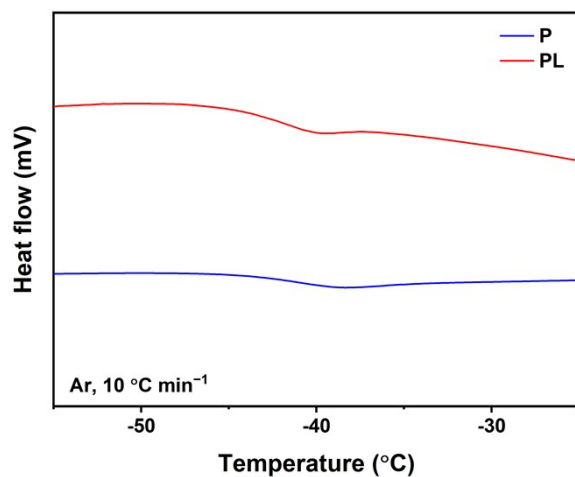


Fig.S7 DSC curve of P and PL membrane.

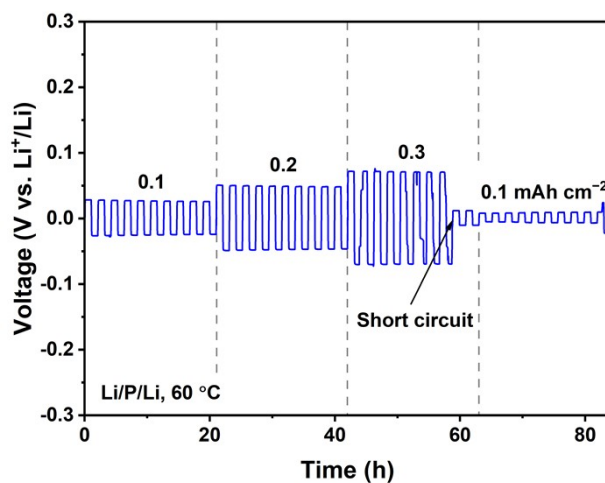


Fig. S8 Rate performance of Li/P/Li cells with stripping/plating of 1h.

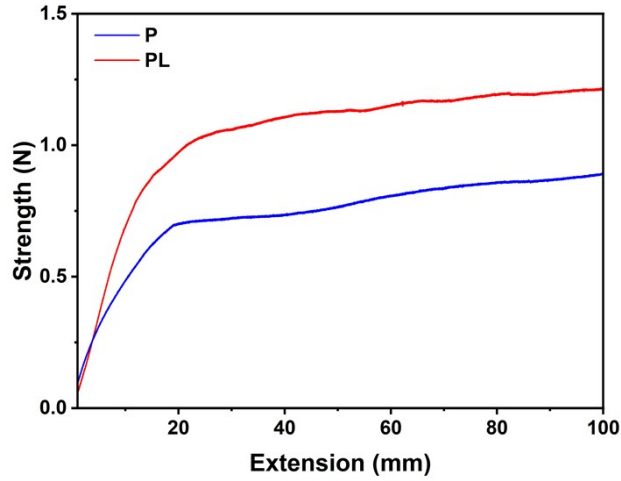


Fig. S9 Stretch Curve of P and PL membrane.

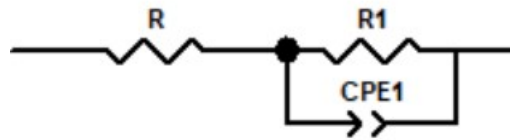


Fig. S10 Equivalent circuit of Li/Li symmetric cells.

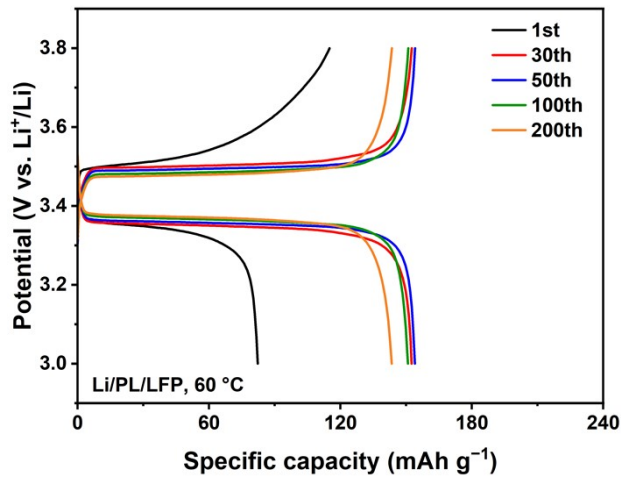


Fig. S11 Voltage-capacity curve of Li/PL/LFP cells at 0.5 C with different cycle

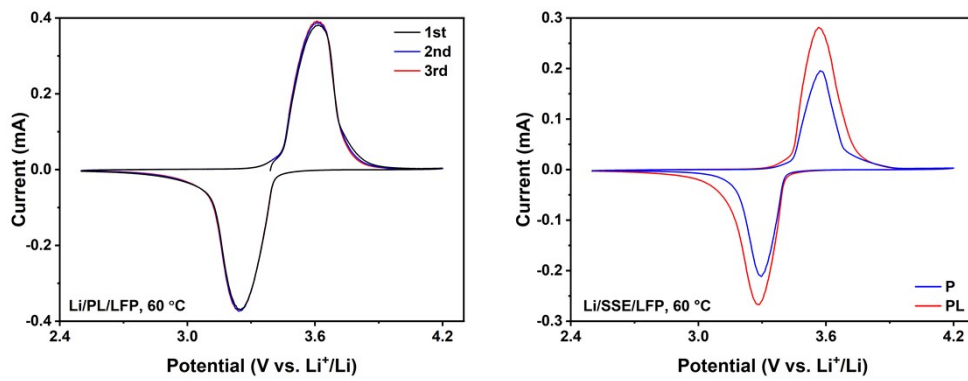


Fig. S12 CV curve of Li/LFP cells.

Table S1 The particle size distribution of LTO.

Item	Unit	Spec.
D10	μm	0.2~0.6
D50	μm	0.8~1.6
D90	μm	≤10

Table S2 Activation energy of PEO-x%LTO membrane.

Sample	Activation energy (kJ mol ⁻¹)	
	30~60 °C	60~80 °C
PEO-0%LTO	81.0	58.0
PEO-20%LTO	118.8	87.7
PEO-40%LTO	122.8	81.6
PEO-60%LTO	89.5	34.0
PEO-80%LTO	97.3	28.1
PEO-100%LTO	90.2	53.7

Table S3 Assignment for FTIR bands of PL membrane.

Wavenumber (cm ⁻¹)	Assignment
3460	O-H stretching of PEO
2880	C-H asymmetric stretching of PEO
1465	CH ₂ scissoring of PEO
1350	CH ₂ asymmetric bending of PEO
1281	CH ₂ symmetric bending of PEO
1232	CH ₂ symmetric twisting of PEO
1187	CF ₃ asymmetric stretching of LiTFSI
1093	C-O-C stretching of PEO
1056	C-O-C stretching of PEO
955	C-O stretching with some CH ₂ asymmetric rocking of PEO
840	C-O stretching of PEO
787	S-N-S asymmetric and symmetric stretching of LiTFSI
738	S-N-S asymmetric and symmetric stretching of LiTFSI
567	CF ₃ asymmetric bending of LiTFSI
520	CF ₃ asymmetric bending of LiTFSI
449	Ti-O bending vibration of Li ₄ Ti ₅ O ₁₂

Table S4 Electronic conductivity of P, PL and lithiated PL membrane.

Sample	Electronic conductivity (S cm⁻¹)
P	2.97E-10
PL	4.12E-10
Lithiated PL	4.76E-10