Supporting Information

Polypropylene (PP) supported Solid Polymer Electrolyte enables high-stable Organic lithium battery at low temperature

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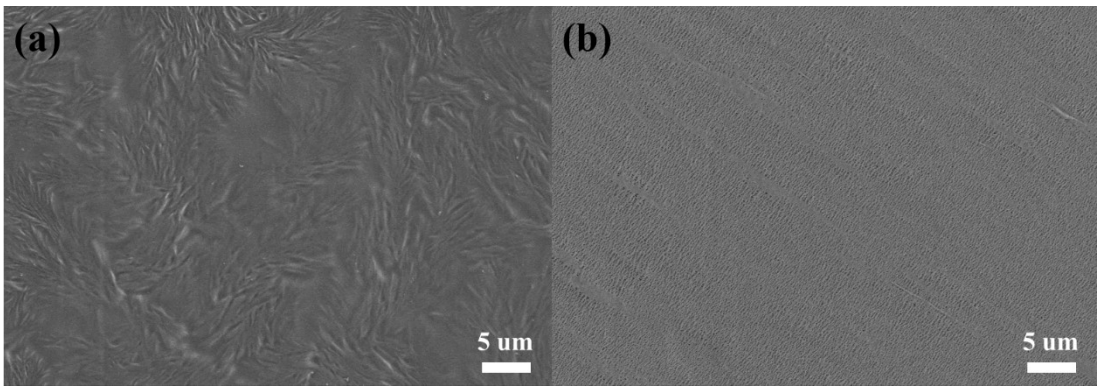

Fig. S1 SEM of the (a) SPEs (b) PP separator.

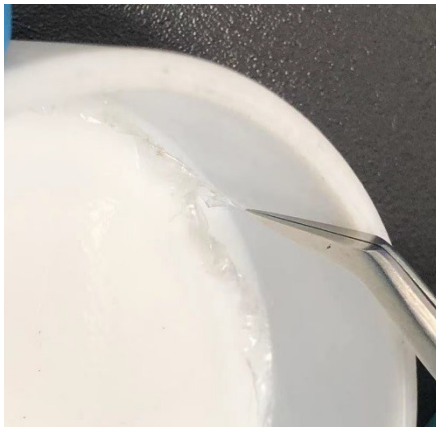

Fig. S2 Picture of PEO/SN past after drying without PP separator.

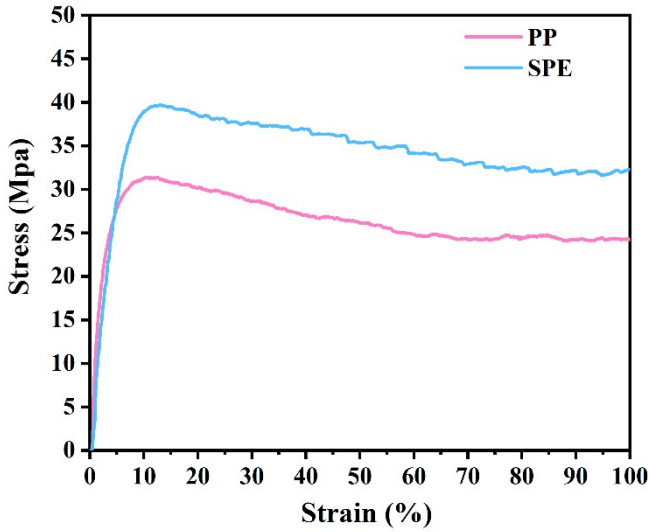

Fig. S3 Stress versus strain curves for PP and SPE film.

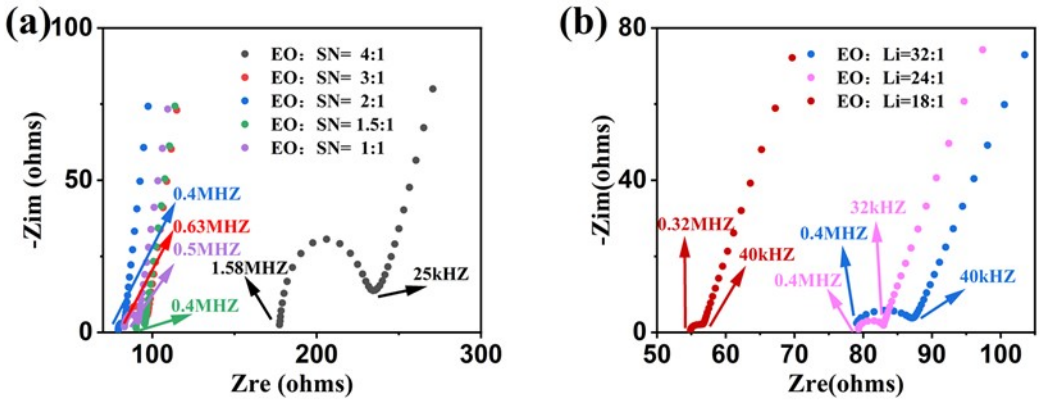

Fig. S4 EIS of various SPEs at room temperature (a) with different SN contents (EO:Li=32:1); (b) with different LiTFSI contents (EO : SN=2:1)

Table S1 Ionic conductivity of SPEs at different temperature with different SN contents (EO:Li=32:1)

σ(S/cm) T / EO：SN	25℃	30℃
1:1	$4.87*10^{-4}$	$1.04*10^{-3}$
1.5:1	$5.85*10^{-4}$	$1.31*10^{-3}$
2:1	$1.13*10^{-3}$	$2.36*10^{-3}$
3:1	$4*10^{-4}$	$5.28*10^{-4}$
4:1	$0.9*10^{-4}$	$1.15*10^{-4}$

Table S2 Ionic conductivity of SPEs at different temperature with different LiTFSI contents (EO: SN=2:1)

σ(S/cm) T / EO：Li	25℃	30℃
32:1	$1.13*10^{-3}$	$2.36*10^{-3}$
24:1	$3.7*10^{-3}$	\
18:1	$4.22*10^{-3}$	\

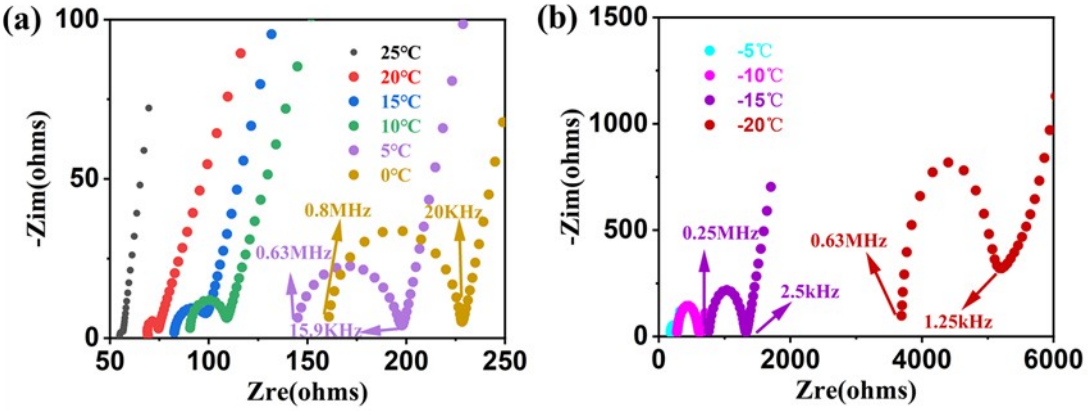

Fig. S5 EIS of the SPEs at different temperature.

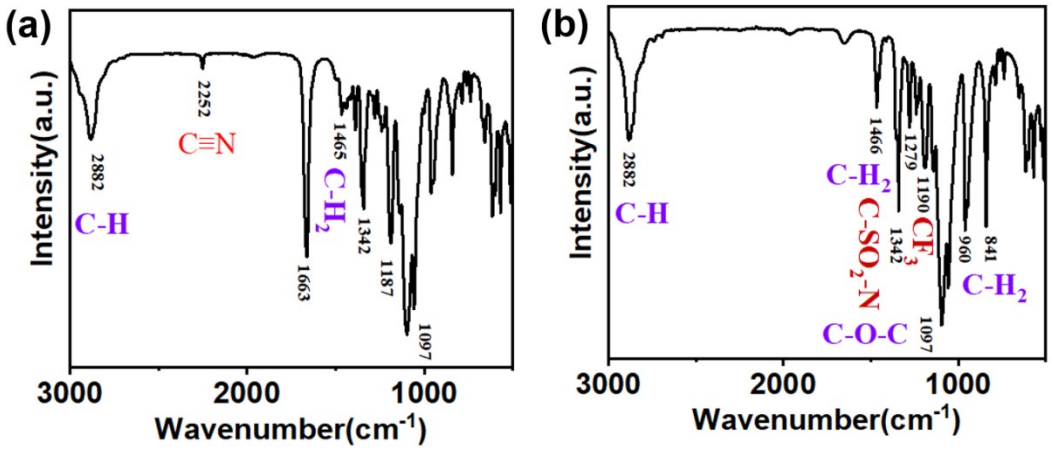

Fig. S6 (a) FTIR of SPE (EO:Li=18:1; EO:SN=2:1); (b) FTIR of PP supported PEO+ LiTFSI electrolyte.

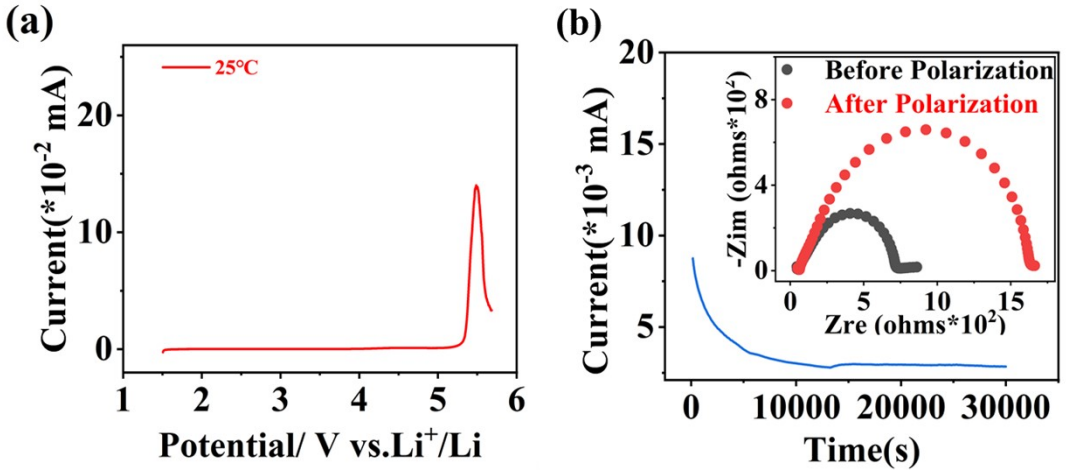

Fig. S7 Electrochemical performance analysis of SPEs (EO: Li=18:1, EO: SN=2:1) (a) LSV of the SPEs at a scan rate of 0.05 mV/s at 25℃. (c) Li||SPEs|| Li symmetrical cell under a polarization voltage of 10mV at 25℃. Inset: the corresponding EIS curves before and after polarization.

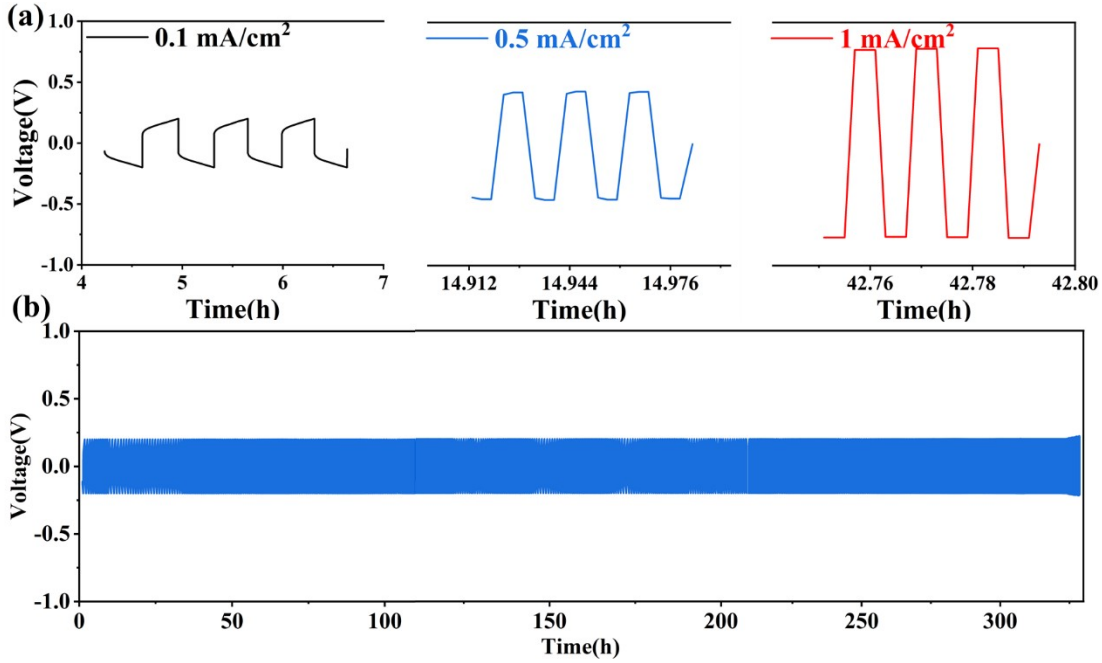

Fig. S8 at 25°C (a) Rate performance of Li||SPEs|| Li battery at various current densities from 0.1 to 1 mA cm^{-2} ; (b) Cycling performance of Li/SPEs/Li symmetrical battery at 0.1 mA cm^{-2}.

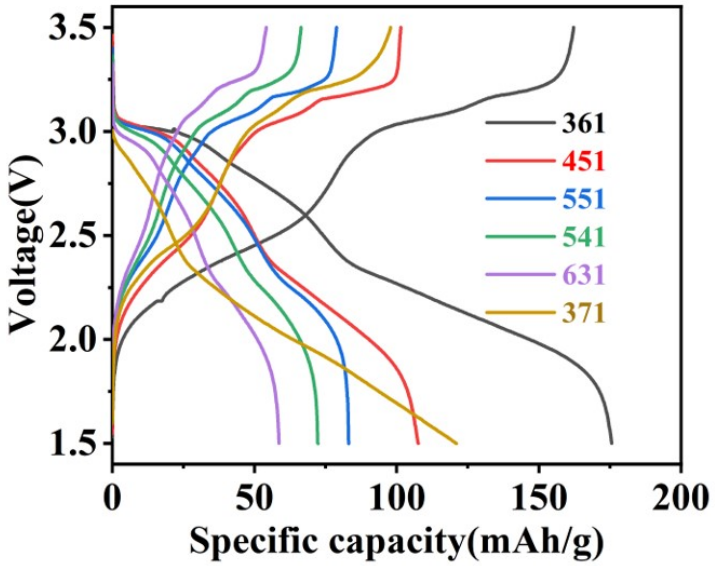

Fig. S9 The charge and discharge curves of PTO||SPEs||Li battery with different proportions of PTO.

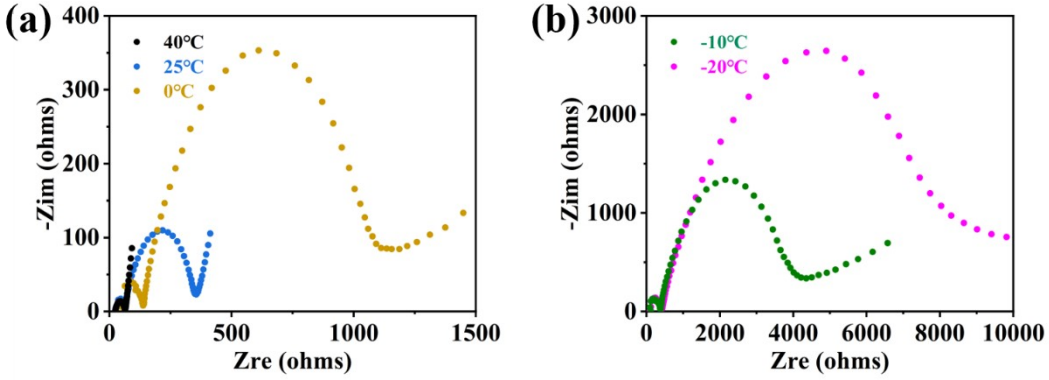

Fig. S10 EIS of the PTO||SPEs||Li battery under different temperature.

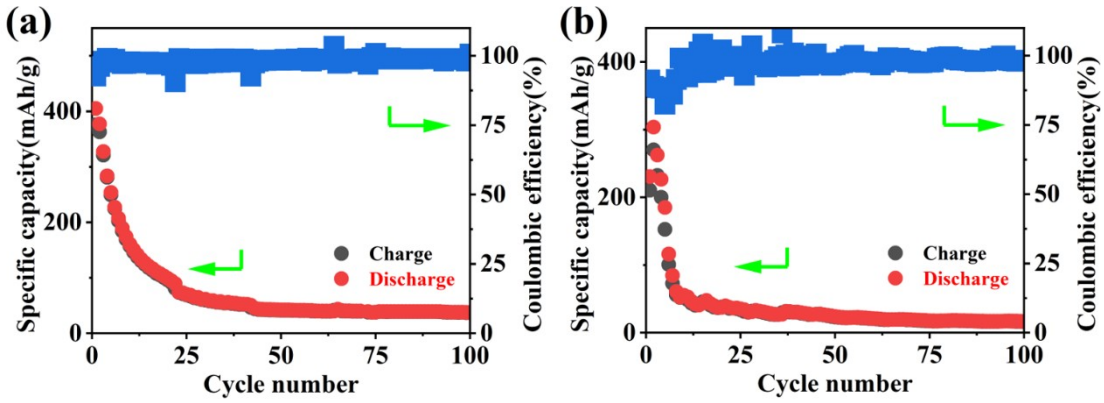

Fig. S11 Cycling performance of PTO||SPEs||Li battery (a) under 40°C at 20 mA g^{-1}; (b) under 25°C at 20 mA g^{-1}.

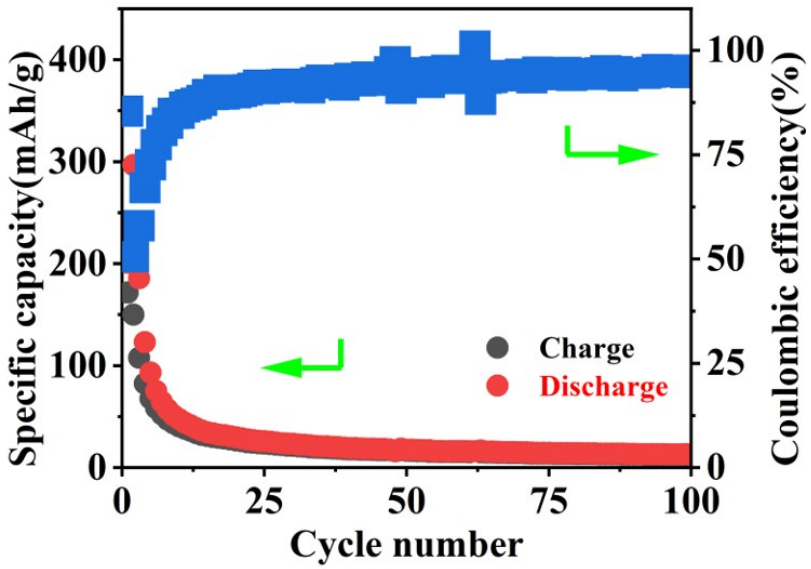

Fig. S12 Cycling performance of PTO||LB-015 electrolyte||Li battery under 0°C at 10 mA g^{-1}.

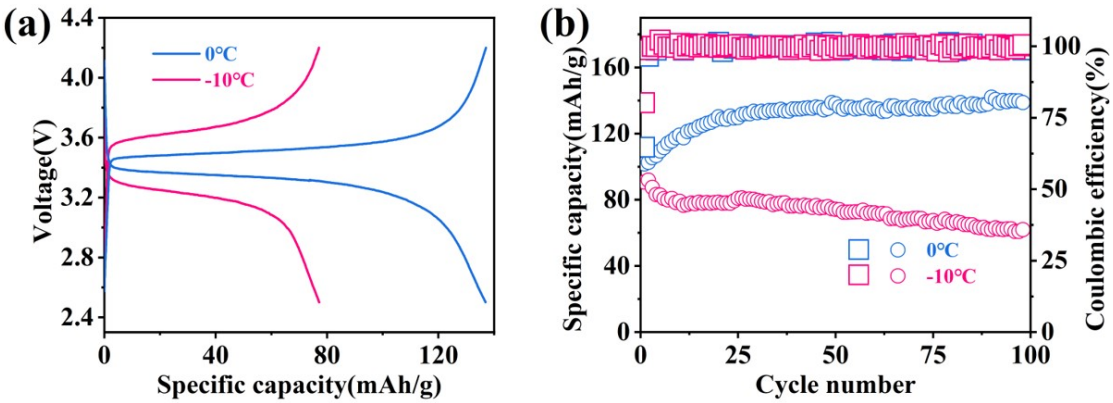

Fig. S13 Cycling performance of $LiFePO_4$||SPEs ‖Li battery under 0℃ and -10 ℃ at 0.1 C (1 C=170 mA g^{-1}).