Surface-modified $BaTiO_3$ as a functional filler in poly(ethylene oxide)-based solid polymer electrolytes for lithium-metal batteries

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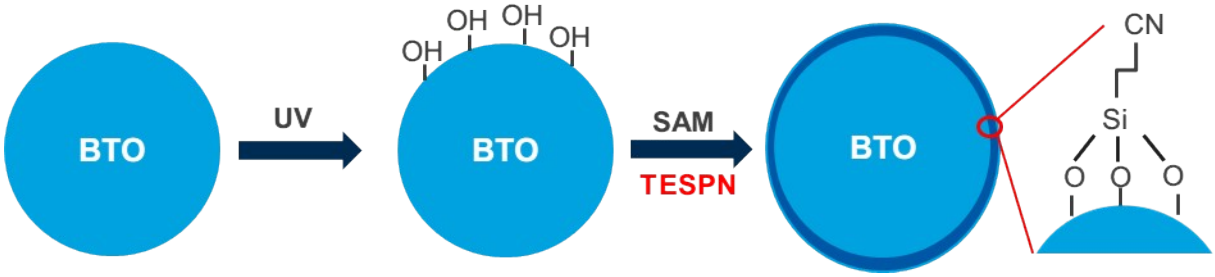

Figure S1. Schematic diagram of the coating process of BTO@TESPN.

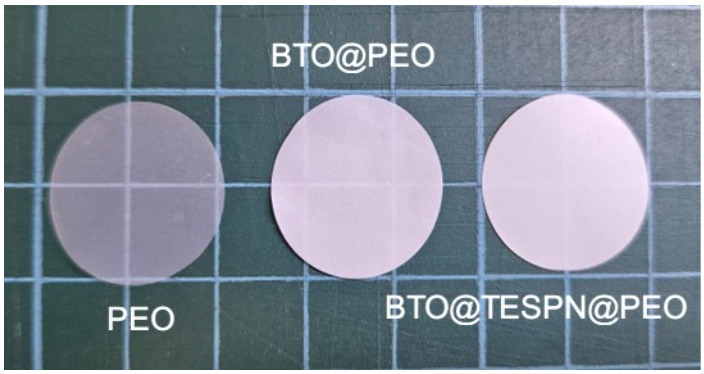

Figure S2. Optical photographs of PEO, BTO@PEO and BTO@TESPN@PEO electrolytes.

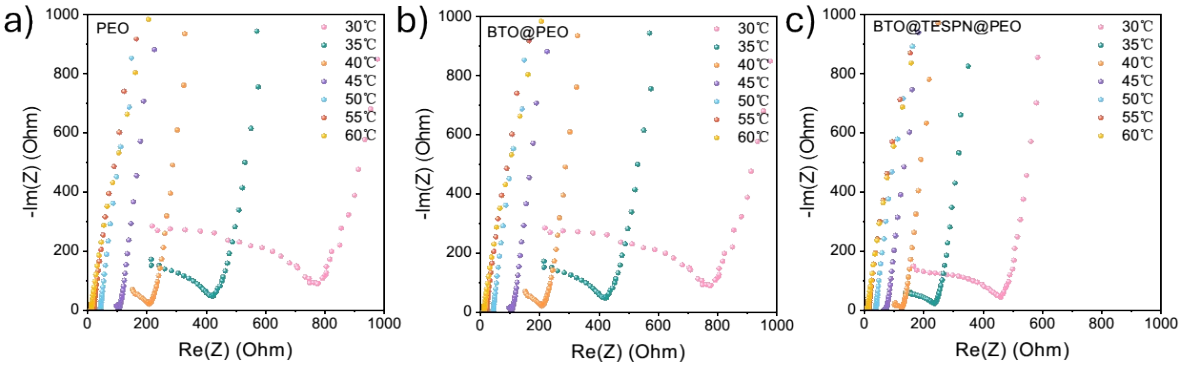

Figure S3. Electrochemical impedance plots of a) PEO, b) BTO@PEO, c) BTO@TESPN@PEO electrolytes in stainless steel-stainless steel symmetric cells at 30-60 ℃.

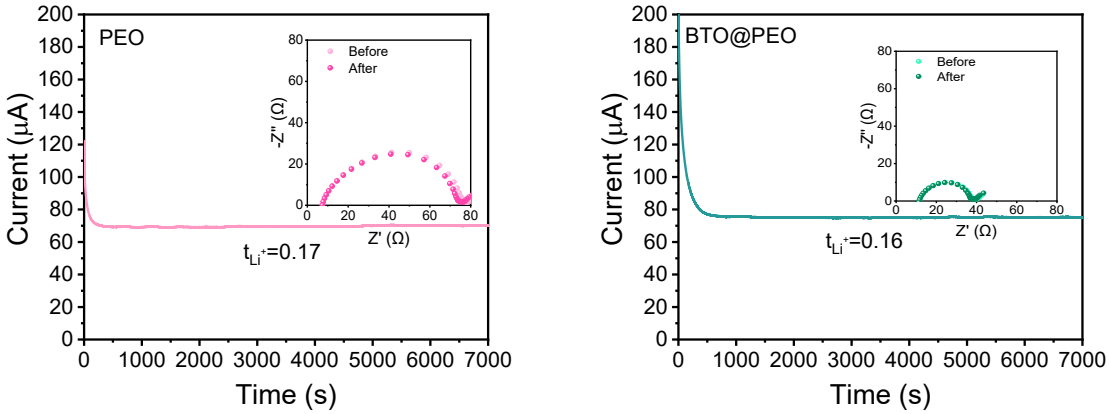

Figure S4. Li-transfer number of PEO and BTO@PEO SPE.

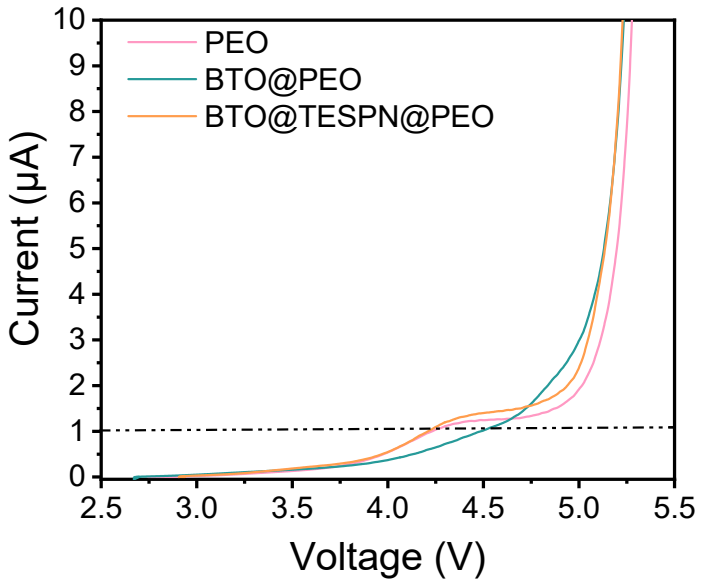

Figure S5. Linear sweep voltammetry plots of PEO, BTO@PEO and BTO@TESPN@PEO electrolytes at a scan rate of 0.1 mV s^{-1} at 60 °C with stainless steel working electrode and Li counter electrode.

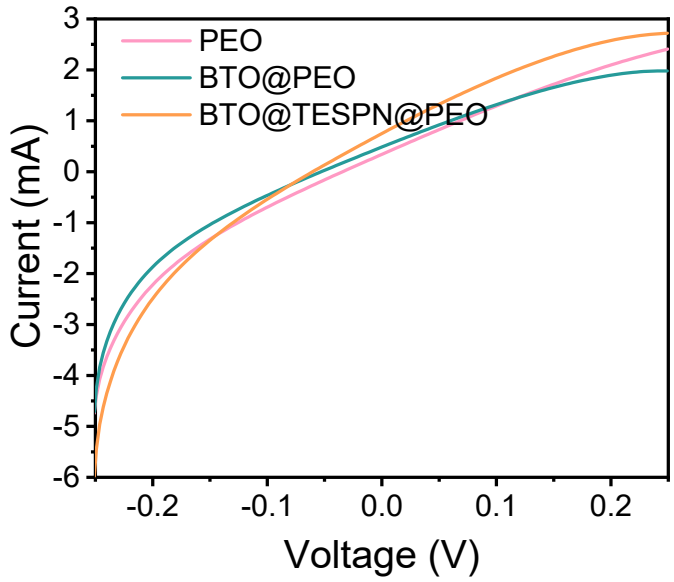

Figure S6. Linear sweep voltammograms of Li-Li symmetric cell with PEO, BTO@PEO and BTO@TESPN@PEO electrolytes from -0.25 V to 0.25 V with a scan rate of 1 mV s^{-1}.

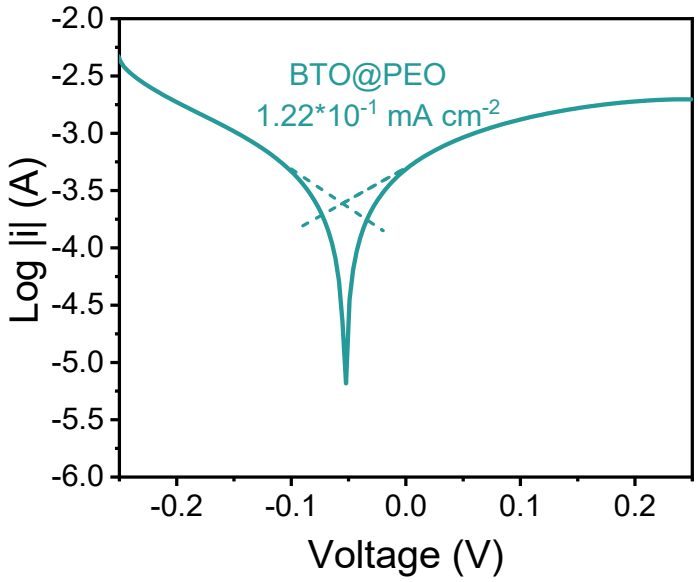

Figure S7. Tafel plots and exchange current density of BTO@PEO obtained from the linear sweep voltammetry tests in the range of -0.25 V to 0.25 V

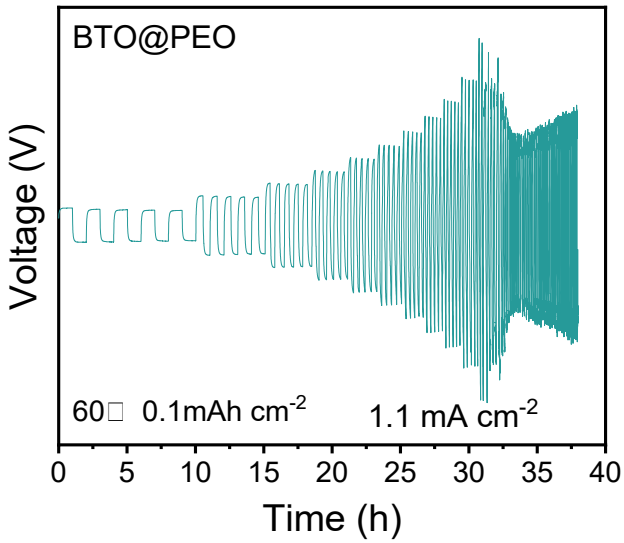

Figure S8. Critical current density of symmetric cells with BTO@PEO electrolytes from a rate-performance test with a capacity of 0.1 mAh cm^{-2} per half cycle.

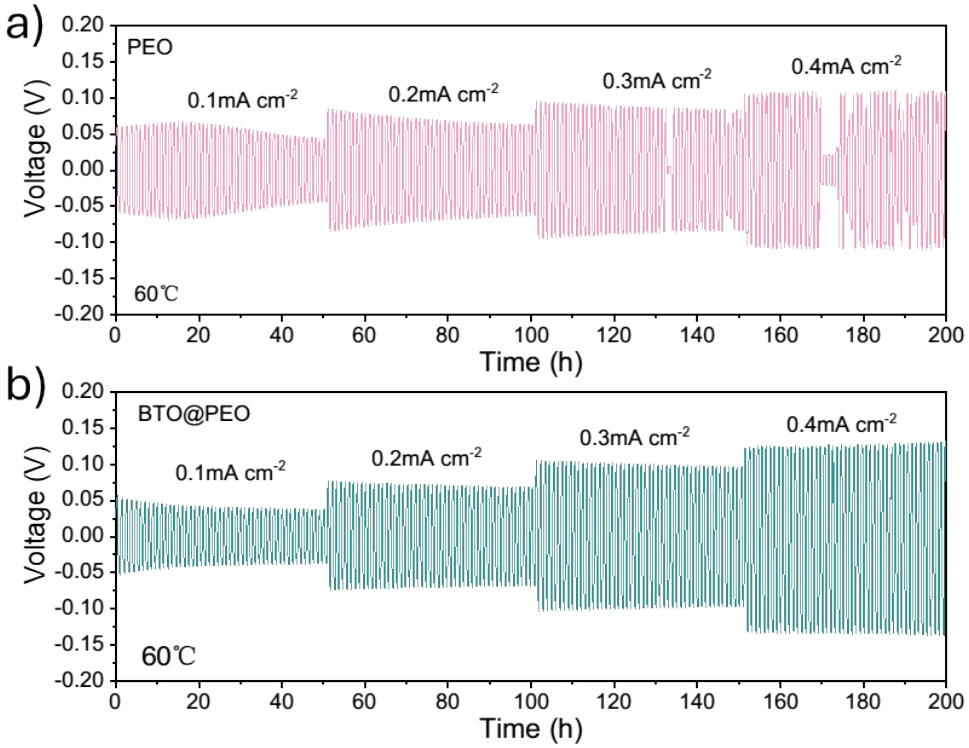

Figure S9. Galvanostatic cycling of Li-Li symmetric cell with a) PEO, b) BTO@PEO from 0.1 to 0.4 mA cm^{-2} with a capacity limit of 0.05 to 0.2 mAh cm^{-2} (half hour charge/half hour discharge).

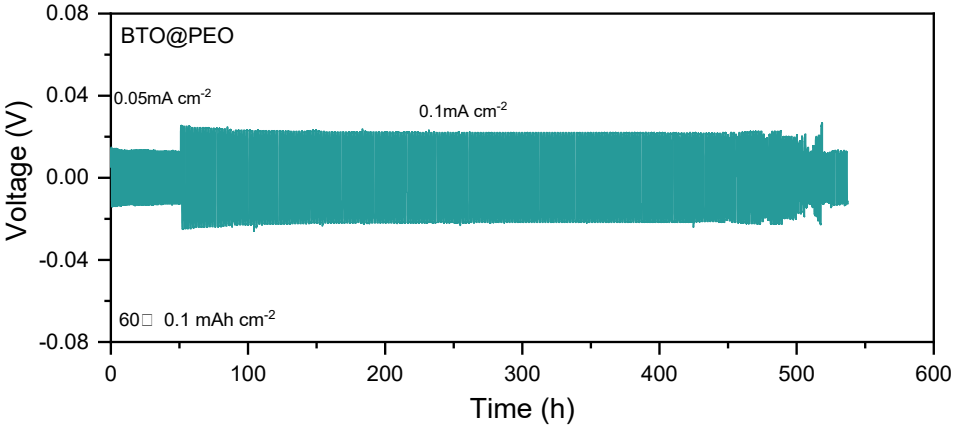

Figure S10. Galvanostatic cycling of Li-Li symmetric cell with BTO@PEO electrolytes with 0.1 mA cm^{-2}.

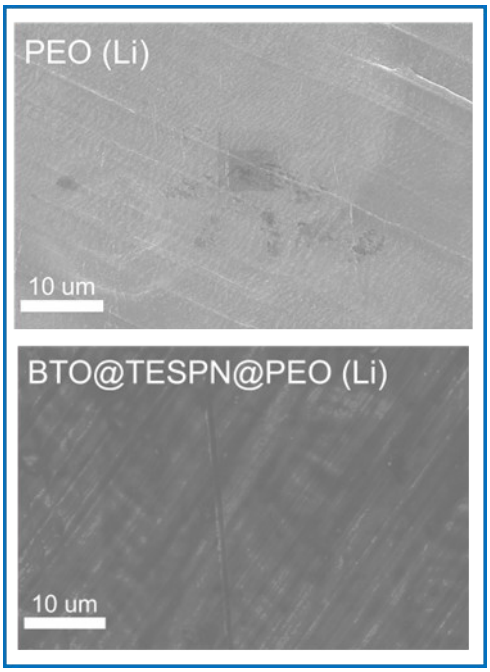

Figure S11. SEM images of Li anode after 10 cycles at 0.1 mA cm^{-2} /0.1 mAh cm^{-2} with PEO and BTO@TESPN@PEO electrolytes.

Table S1. Comparison of capacity of PEO-based electrolyte

Electrolyte compositions	Li^+:EO	Specific capacity (mAh g^{-1})	Cycle number	Capacity retention	Working temperature (℃)	Current density
PEO+LLZO+SCN[1]	1:18	130.2	500	80%	60	1.0 C
PEO+SN+$LiAlO_2$[2]	1:10	141.3	25	84.9%	60	1.0 C
PEO+LLZTO+SN[3]	1:18	151.1	200	98%	60	0.5 C
PEO+LLZTO@PDA[4]	1:8	142.6	50	99%	50	0.2 C
PEO+PI[5]	1:15	138	300	96%	60	0.5 C
PEO+MOF[6]	1:18	151	100	95%	60	0.5 C
PEO+aligned LAGP[7]	1:8	148.7	300	93.3%	60	0.3 C
PEO+LLZO[8]	1:16	162.7	120	91.7%	60	0.1 C
PEO+KPF_6[9]	1:16	142.1	200	91.3%	60	0.5 C
PEO+H_2TPP(PEG)$_4$[10]	-	158.2	120	97.1%	60	0.2 C
PEO+LS-AFE[11]	1:16	112.4	150	96.7%	60	2.0 C
PEO+SBA-LiIL[12]	1:16	150.3	90	88.4%	60	0.07 C
PEO+HPEA[13]	1:26	155.4	110	90.8%	50	0.1 C
PEO+BTO@TESPN (our work)	1:20	155.4	700	93.0%	60	0.5 C

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