

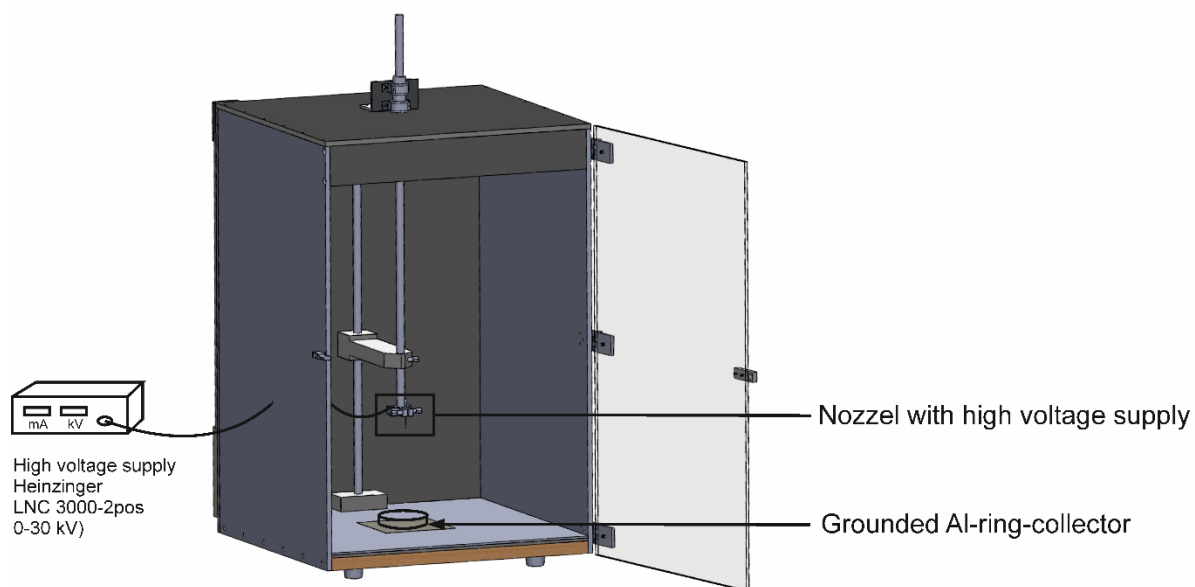
## SUPPORTING INFORMATION

### **Enhancement of Li ion conductivity by electrospun polymer fibers and direct fabrication of solvent-free separator membranes for Li ion batteries**

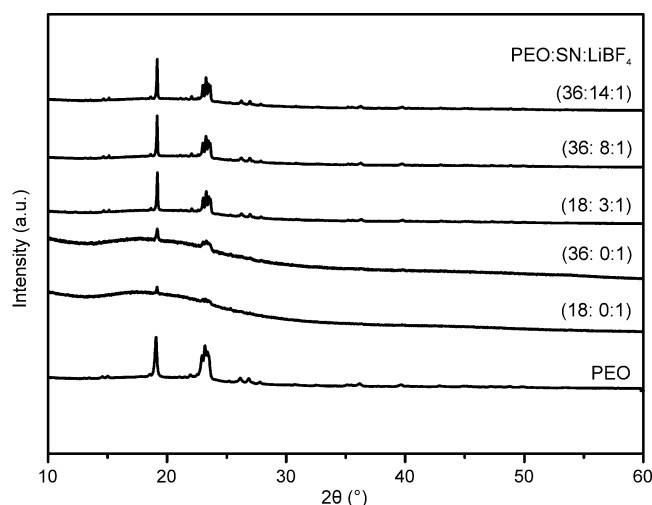
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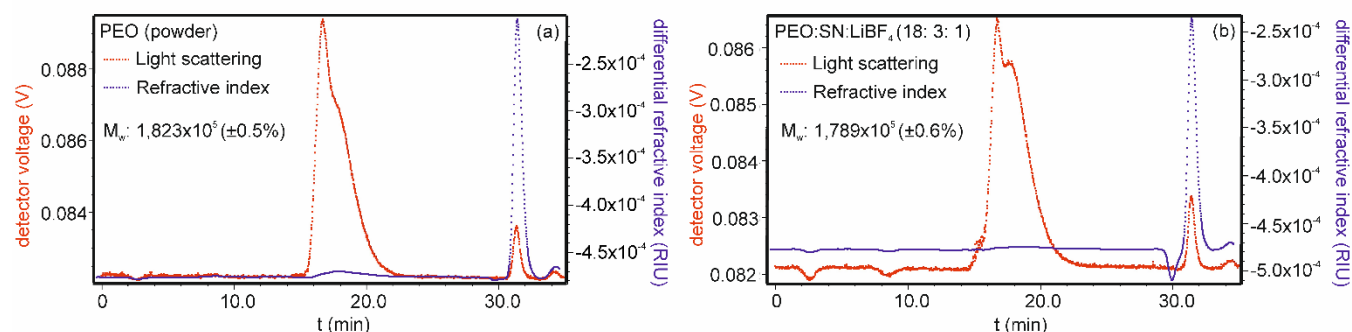
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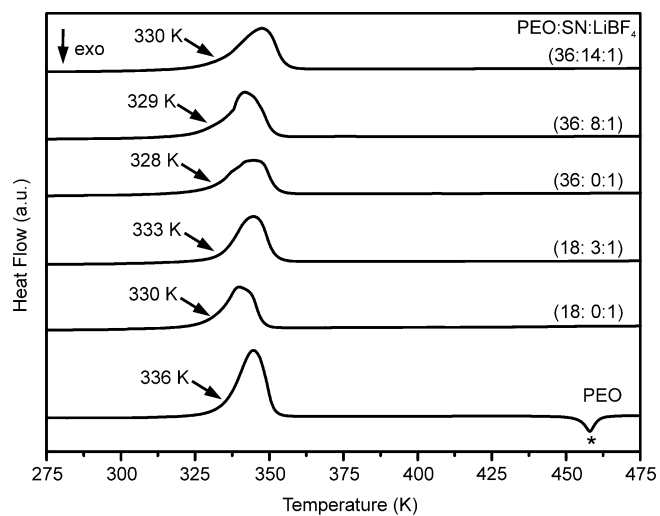
**Figure S1.** Construction drawing of the homemade electrospinning apparatus constructed by K. M. Freitag.



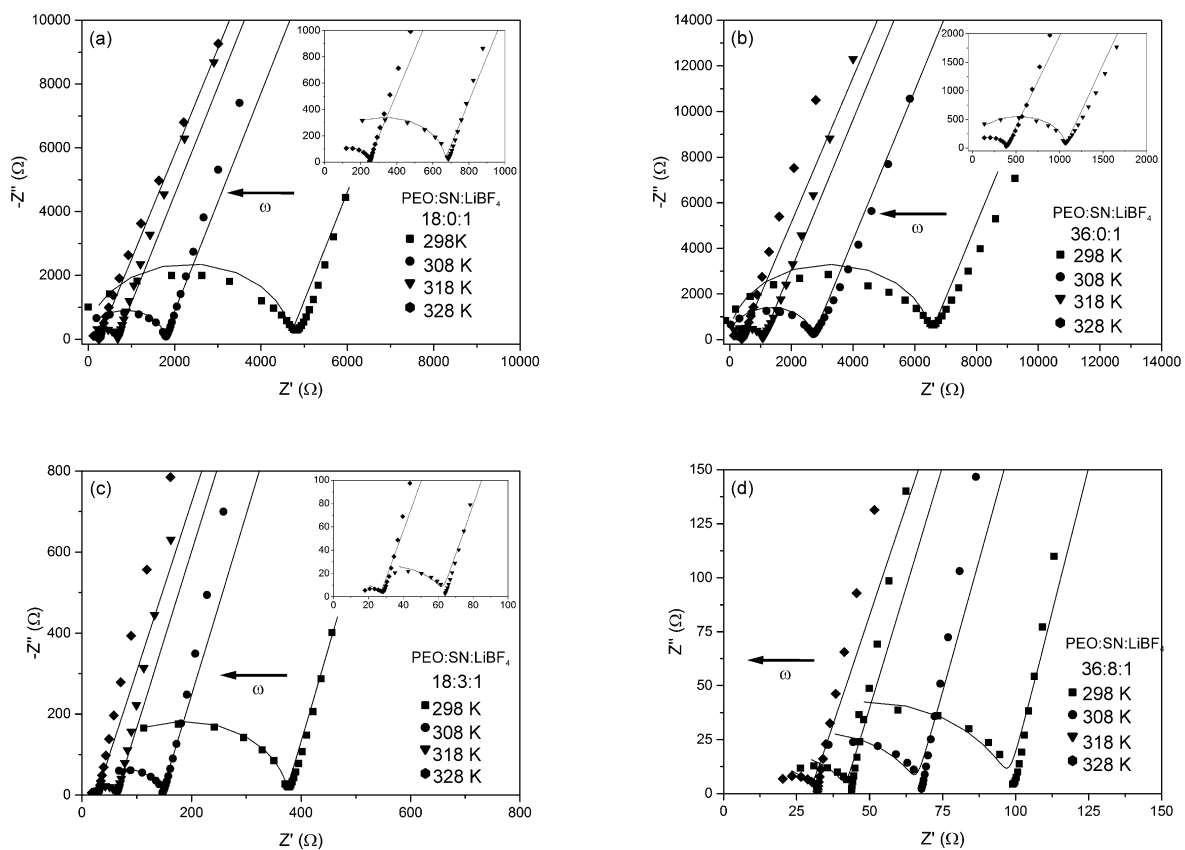
**Figure S2.** X-ray diffraction pattern (Cu-K $\alpha$ 1 radiation,  $\lambda = 1.54051$  Å, germanium monochromator) between 10 to 60 ° of the PEO:SN:LiBF<sub>4</sub> (SN: succinonitrile, PEO: Poly(ethylene oxide)) membranes with different molar ratios (36:0:1, 18:0:1, 18:3:1, 36:8:1, 36:14:1) and pristine PEO as reference. No other crystalline phases than PEO were present in the electrospun membranes.



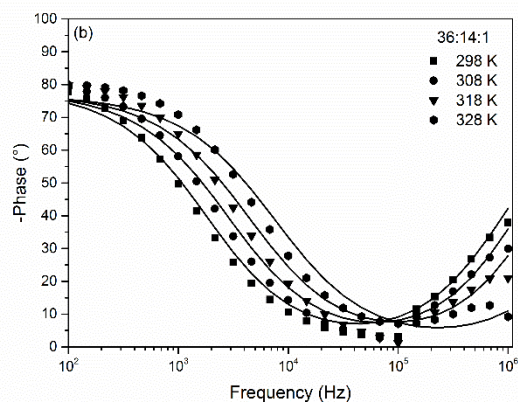
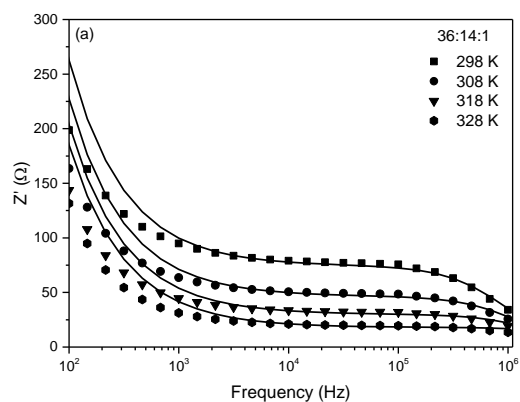
**Figure S3.** GPC-LS/RI profiles as a function of elution time for (a) pristine PEO powder and (b) for the PEO:SN:LiBF<sub>4</sub> membrane. The detected  $M_w$ s are the same, before and after the electrospinning process, within the error.



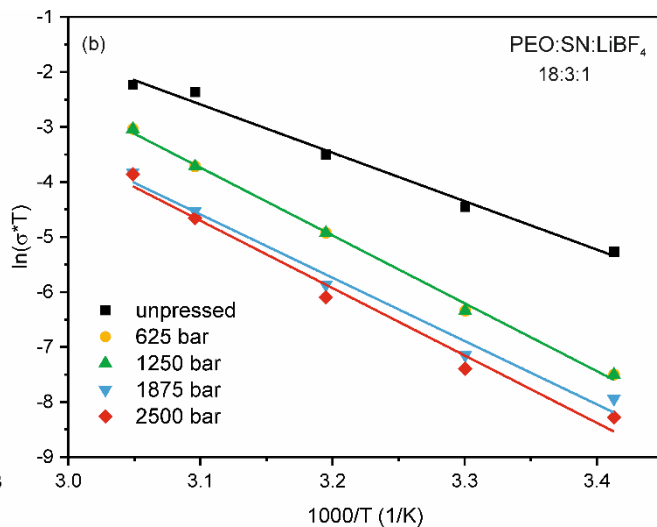
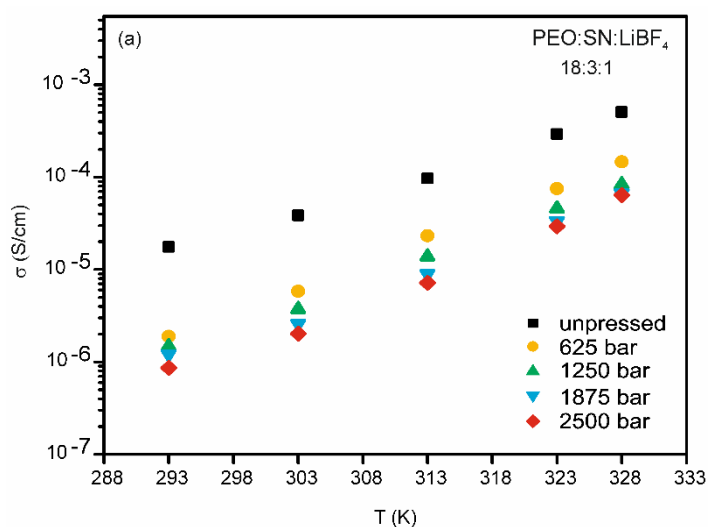
**Figure S4:** DSC curves of the PEO:SN:LiBF<sub>4</sub> (SN: succinonitrile, PEO: poly(ethylene oxide)) membranes with different molar ratios (36:0:1, 18:0:1, 18:3:1, 36:8:1, 36:14:1) and pristine PEO with respective T<sub>g</sub>, \*: thermal decomposition of PEO. For reasons of clarity only the reversal signals in temperature range of 275 to 475 K are shown.



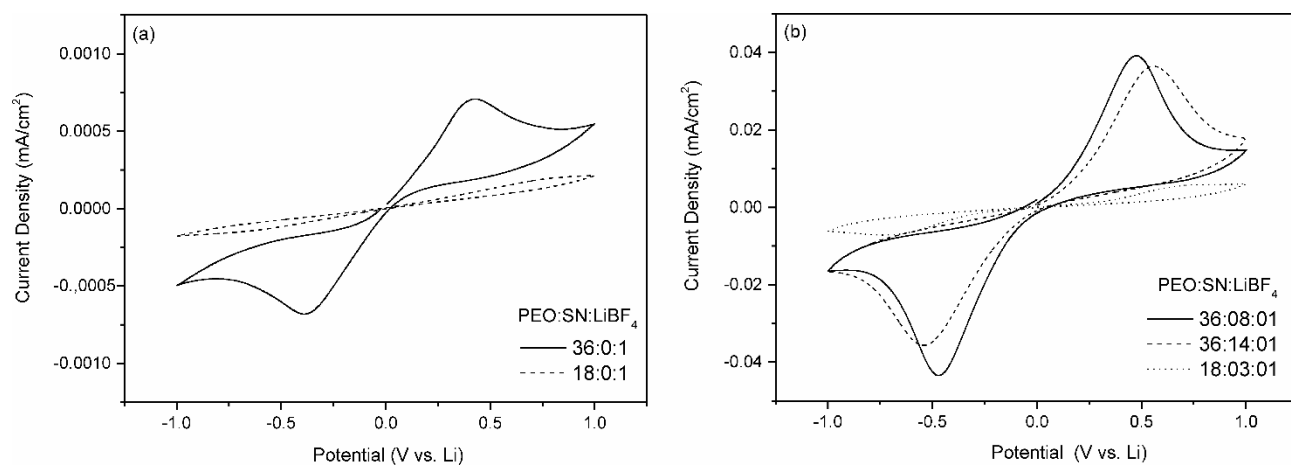
**Figure S5:** Changes of Nyquist plots between 298 and 328 K for the PEO:SN:LiBF<sub>4</sub> (SN: succinonitrile, PEO: poly(ethylene oxide)) membranes with the ratios: (a) 18:0:1, (b) 36:0:1, (c) 18:3:1, (d) 36:8:1.



**Figure S6:** Changes of Bode plots between 298 and 328 K for the PEO:SN:LiBF<sub>4</sub> (SN: succinonitrile, PEO: poly(ethylene oxide)) membrane with the ratio 36:14:1, (a)  $Z'$  against Frequency, (b)  $-Phase$  against Frequency.



**Figure S7:** (a) Ionic conductivities as function of temperature (293–328 K) for PEO:SN:LiBF<sub>4</sub> samples with molar ratio 18:3:1, unpressed and pressed with 625, 1250, 1875, 2500 bar, (b) Arrhenius plot with linear fit of the PEO:SN:LiBF<sub>4</sub> samples with molar ratio 18:3:1, unpressed and pressed with 625, 1250, 1875, 2500 bar.



**Figure S8:** CV diagrams of Li-(PEO:SN:LiBF<sub>4</sub> membranes)-Li symmetric cell at 298 K with a scan rate of 0.1 mV/s between -1 and 1 V, showing the first sweep: (a) 36:0:1 (dense); 18:0:1 (dashed), (b) 36:14:1 (dashed); 36:8:1 (dense); 18:3:1 (dotted). (SN: succinonitrile, PEO: poly(ethylene oxide))