

Electronic Supplementary Information for

Hybrid electrolyte enables safe and practical 5-V $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ batteries

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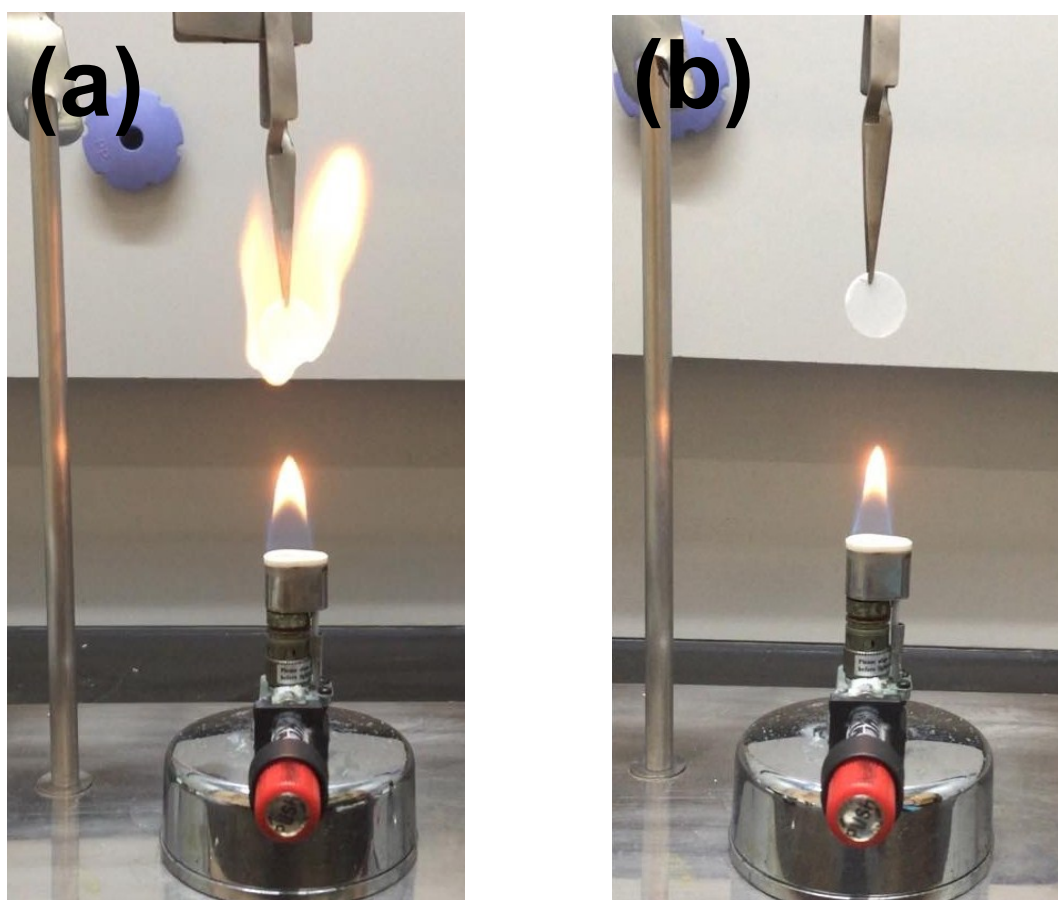
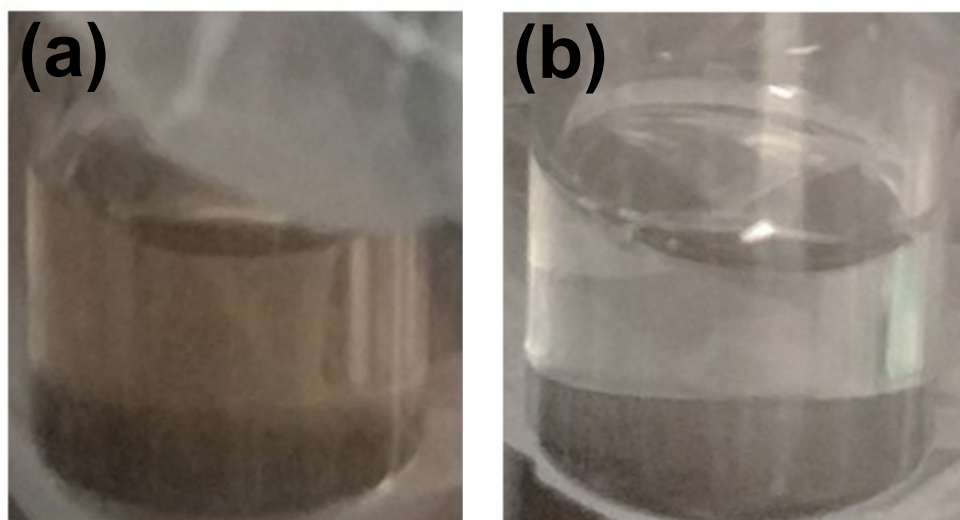


Figure S1. Flammability testing results of (a) 1 M $\text{LiPF}_6/\text{EC}:\text{DEC}$ and (b) 1 M $\text{LiTFSI}/\text{PMP}-\text{TFSI IL}$ electrolytes.



(c) Electrolyte	Mn concentration	Ni concentration
1 M LiPF ₆ /EC:DEC	514 ppm	103 ppm
1 M LiTFSI/PMP-TFSI	Not detectable	Not detectable

Figure S2. Immersion tests of LNMO powder (0.5 g) in 2 mL of (a) 1 M LiPF₆/EC:DEC and (b) 1 M LiTFSI/PMP-TFSI IL electrolytes after 1 month. (c) Concentrations of Mn and Ni dissolved in the electrolytes.

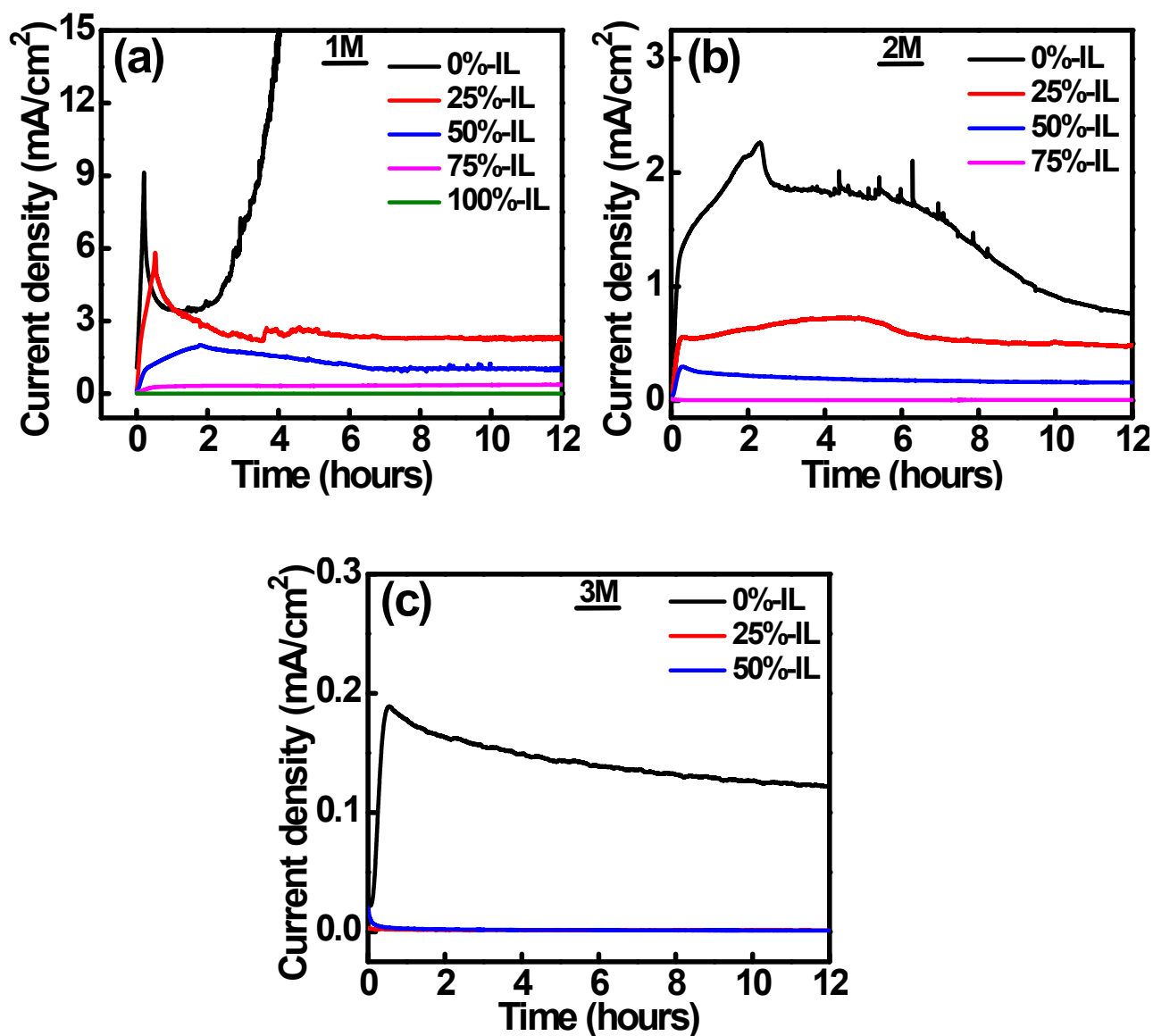


Figure S3. Chronoamperometry data of Al electrodes recorded in various electrolytes with (a) 1 M, (b) 2 M, and (c) 3 M LiTFSI at 5 V.

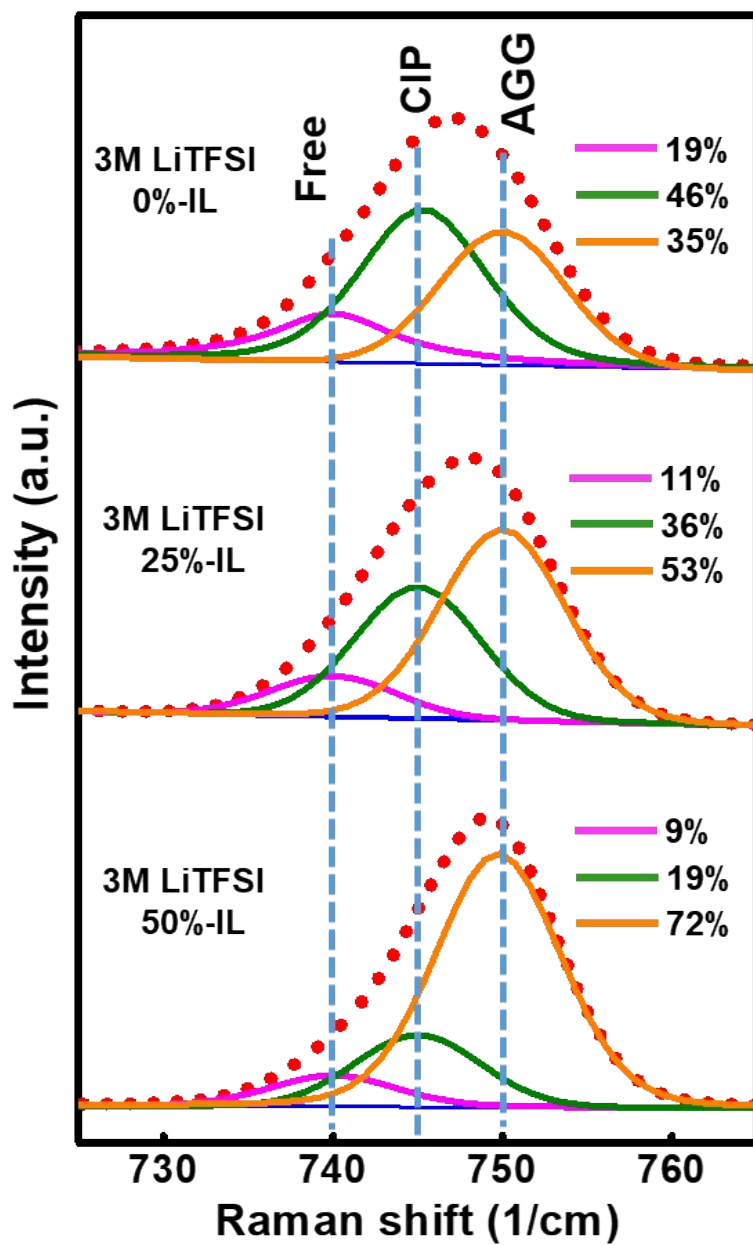


Figure S4. Raman spectra of 3 M LiTFSI/0%-IL, 3 M LiTFSI/25%-IL, and 3 M LiTFSI/50%-IL electrolytes.

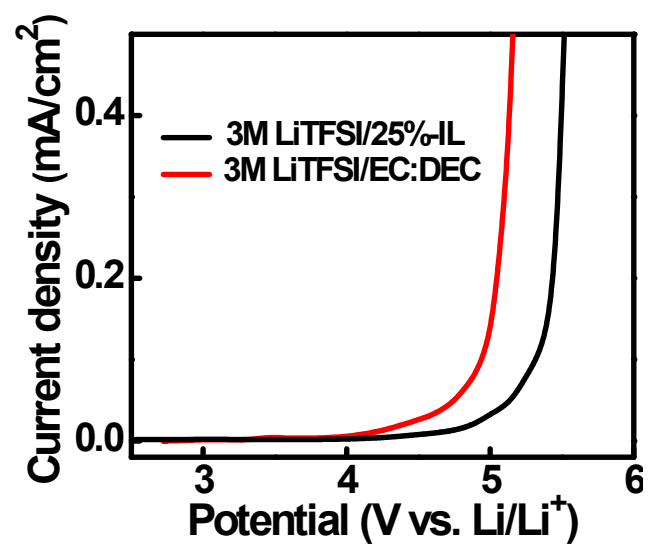


Figure S5. LSV curves of Pt electrodes recorded in 3 M LiTFSI/0%-IL and 3 M LiTFSI/25%-IL electrolytes with potential sweep rate of 1 mV s⁻¹.

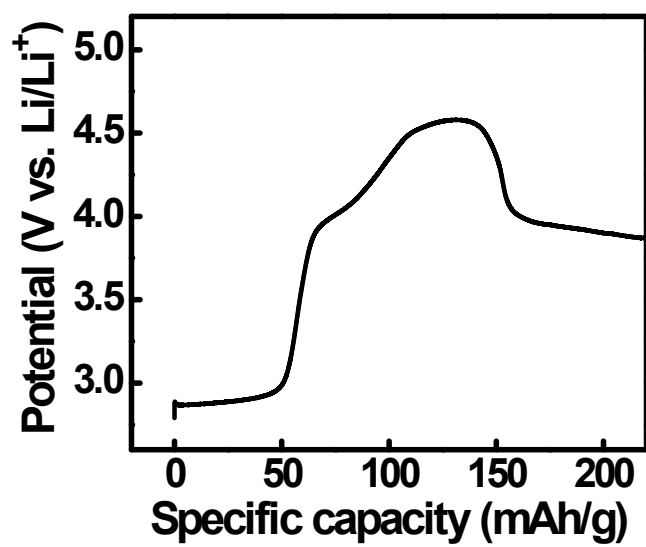


Figure S6. Charging curve of 3 M LiTFSI/0%-IL LNMO cell

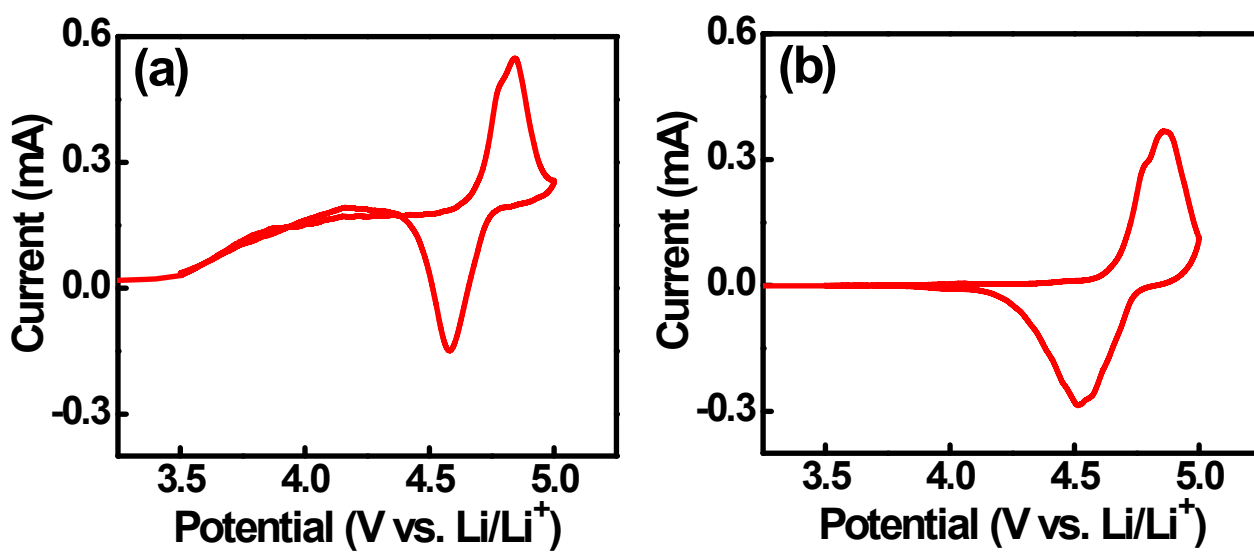


Figure S7. Cyclic voltammetry data of LNMO cells with (a) 3 M LiTFSI/0%-IL and (b) 3 M LiTFSI/25%-IL electrolytes recorded at 0.1 mV s⁻¹.

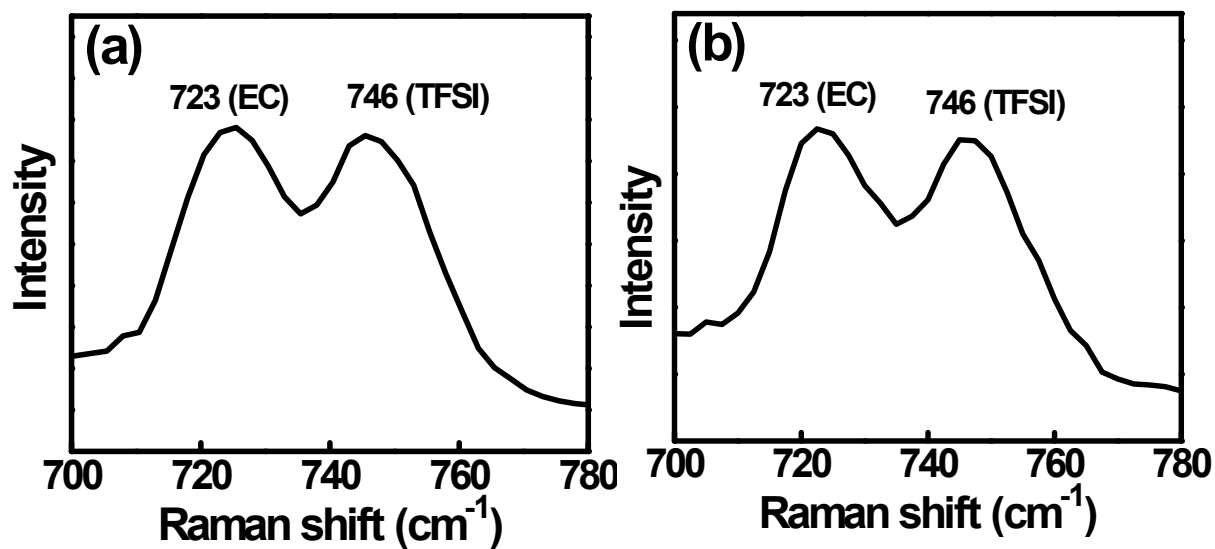


Figure S8. Raman spectra of (a) fresh 3 M LiTFSI/25%-IL electrolyte and (b) the same electrolyte after 20 charge-discharge cycles extracted from LNMO cell.

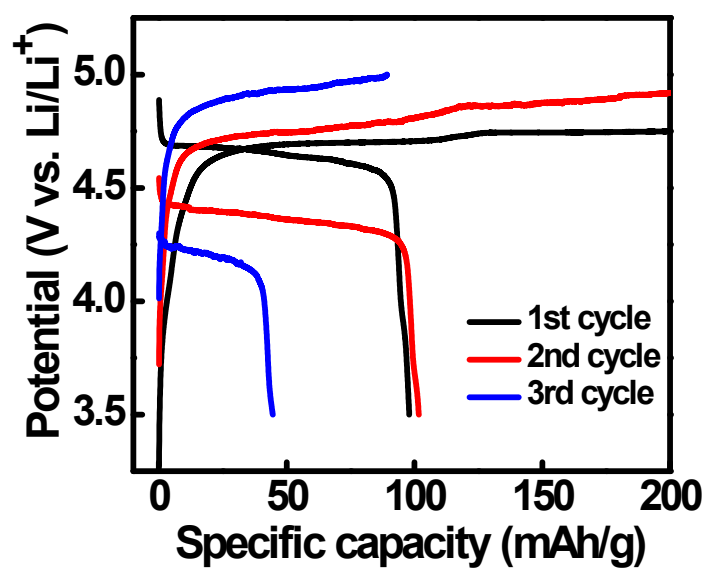


Figure S9. Charge-discharge curves of LNMO cell with 1 M LiPF₆/EC:DEC electrolyte recorded at 0.1 C and 55 °C.