Supporting information: Early-Stage Decomposition of Solid Polymer Electrolytes in Li-Metal Batteries

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Experimental information

The IMFP was calculated from the TPP-2 model[1], using PCL[2] as model to describe probing depth in the PEO:LiTFSI, PCL:LiTFSI and PTMC:LiTFSI solid polymer electrolyte systems. The IMFP (λ) was obtained using the kinetic energies 710eV, 555eV, 420eV, 310eV, 180 eV, corresponding to the C1s peak binding energy at photon energies 1000eV, 845eV, 710eV, 600eV, and 370eV. Information depths for the used photon energies were calculated to 6.9 nm, 5.7 nm, 4.5 nm, 3.6 nm and 1.2 nm (3λ)

The C1s spectra used to analyze the depth profile and calculate the composition at each probing depth is shown in figure S1. The spectra are fitted using a Shirley background and a Voigt function for each peak component.

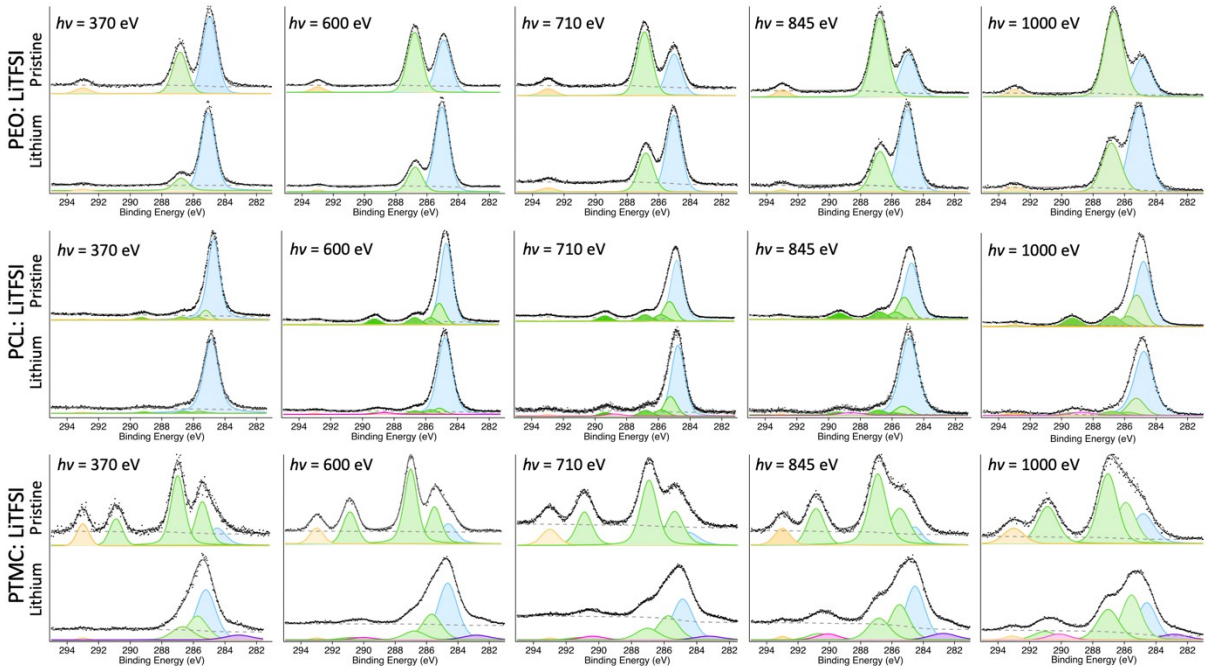

Figure S1. C1s spectra of PEO:LiTFSI, PCL:LiTFSI and PTMC:LiTFSI before and after lithium deposition with varied photon energy. Green: polymer, blue: hydrocarbons, orange: LiTFSI, pink: degradation peaks (not present in the pristine sample), purple: unidentified degradation products.

References

1. Tanuma, S.; Powell, C.J.; Penn, D.R., Calculations of electron inelastic mean free paths. IX. Data for 41 elemental solids over the 50 eV to 30 keV range, *Surf. Interface Anal.,* **2011,** (43), 689-713.
2. Cumpson, P.J., Estimation of inelastic mean free paths for polymers and other organic materials: use of quantitative structure–property relationships, *Surf. Interface Anal.* **2001**, (31), 23–34.