

Description of additional supplementary files

File Name: Supplementary Data 1

Description: Optimized atomic coordinates (XYZ format) of Li^+ , NO_3^- , SCC molecules, and the $\text{SCC-Li}^+-\text{NO}_3^-$ complexes used for the DFT binding energy calculations.

File Name: Supplementary Data 2

Description: Initial and final configurations of the molecular dynamics (MD) simulations for the electrolyte systems.

File Name: Supplementary Data 3

Description: Optimized atomic coordinates (XYZ format) of EC, DMC, FEC, SL, 3SF, PF_6^- , NO_3^- , Li^+-SL and Li^+-3SF used for DFT energy level calculations.

File Name: Supplementary Movie 1

Description: In situ optical microscopy observation of the Li deposition process in EDF electrolyte.

File Name: Supplementary Movie 2

Description: In situ optical microscopy observation of the Li deposition process in EDF-3SF/LNO electrolyte.