Supporting Information

Figure S1. EDX pattern of (A) Pristine ACM electrodes, (B) ACM electrodes discharged to 2 V in triglyme/LiTFSI solution, and (C) ACM electrodes charged to 4.3 V in triglyme/LiTFSI solution
Figure S2. FTIR spectra of (a) pristine ACM electrodes, (b) ACM electrodes discharged to 2 V in triglyme/LiTFSI solution (c) ACM electrodes charged to 4.3 V in triglyme/LiTFSI solution.

Figure S3. High resolution SEM images of ACM/α-MnO₂ hybrid electrodes.
**Figure S4.** FTIR spectra of (a) Pristine ACM/α-MnO$_2$ hybrid electrodes (b) ACM/α-MnO$_2$ hybrid electrodes discharged to 2 V in triglyme/LiTFSI solution, and (c) ACM/α-MnO$_2$ hybrid electrodes charged to 3.75 V in triglyme/LiTFSI solution.

**Figure S5.** EDX pattern of (A) Pristine ACM/α-MnO$_2$ hybrid electrodes (B) ACM/α-MnO$_2$ hybrid electrodes discharged to 2 V in triglyme/LiTFSI solution, and (C) ACM/α-MnO$_2$ hybrid electrodes charged to 3.75 V in triglyme/LiTFSI solution.
Scheme S1. Suggested mechanism for the decomposition of LiTFSI during electrochemical cycling