Supporting Information

Achieving Superb Sodium Storage Performance on Carbon Anodes through Ether-derived Solid Electrolyte Interphase

Jun Zhang[a,b,‡], Da-Wei Wang[c,‡], Wei Lv[b], Siwei Zhang[b], Qinghua Liang[b], Dequn Zheng[b], Feiyu Kang[a,b] and Quan-Hong Yang[a,b,d,*]

[a]Tsinghua-Berkeley Shenzhen Institute (TBSI), Tsinghua University, Shenzhen 518055, China.

E-mail: yang.quanhong@sz.tsinghua.edu.cn

[b]Shenzhen Key Laboratory for Graphene-Based Materials and Engineering Laboratory for Functionalized Carbon Materials, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, China.

[c]School of Chemical Engineering, The University of New South Wales, Sydney, NSW, 2052, Australia.

[d]School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072, China.

E-mail: qhyangcn@tju.edu.cn

‡These authors are equal main contributors.

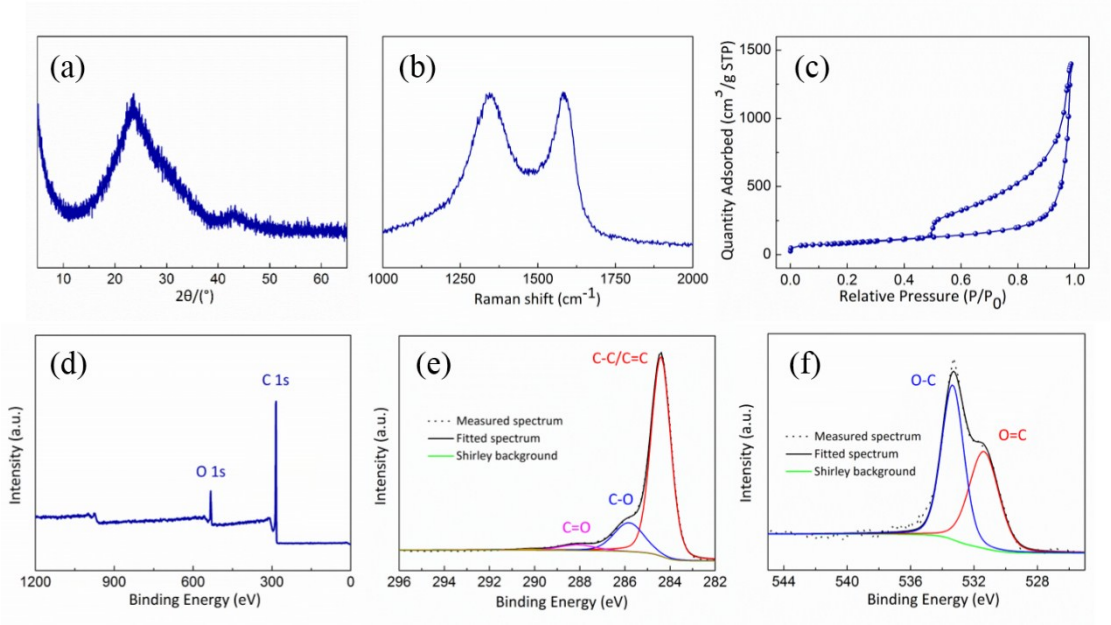

Figure S1 Systematic characterization of rGO samples. (a) XRD profile, (b) Raman spectra, (c) N_2 adsorption isotherm, (e) XPS C 1s and (f) XPS O 1s spectrum for rGO samples.

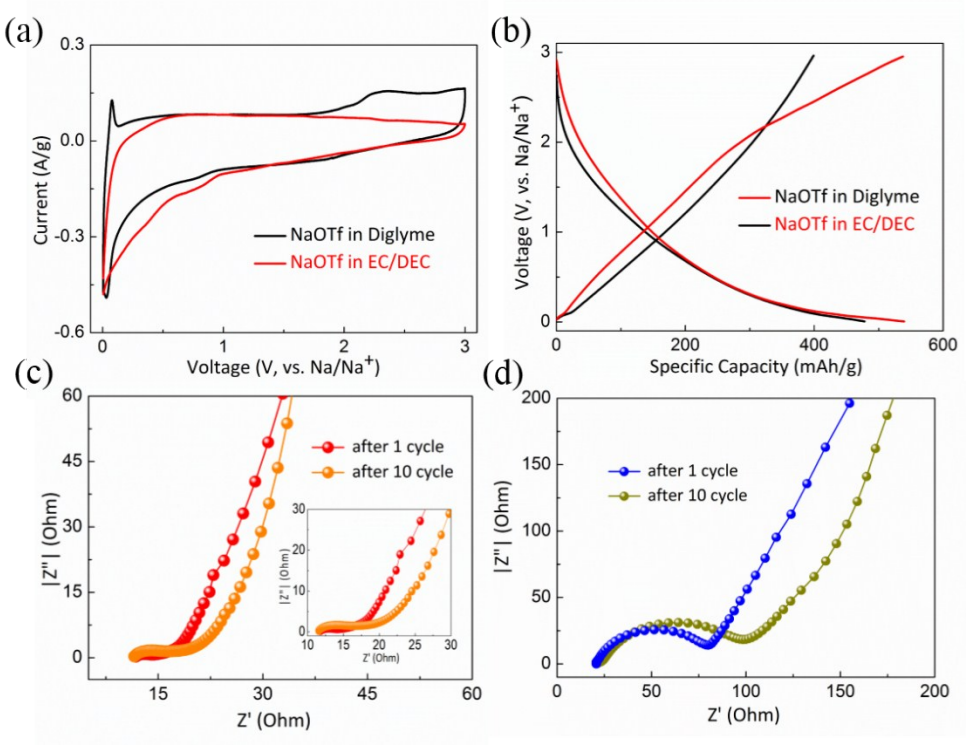

Figure S2 Comparison of electrochemical performance of rGO electrodes in different solvents. (a) CV curves of the third cycle for NaOTf in EC/DEC and Diglyme at a scanning rate of 0.2 mV/s. (b) Galvanostatic charge-discharge profiles of the third cycle for NaOTf in EC/DEC and Diglyme at a current density of 0.1 A/g. (c) EIS after 1 cycle and 10 cycles for NaOTf in Diglyme. (d) EIS after 1 cycle and 10 cycles for NaOTf in EC/DEC.

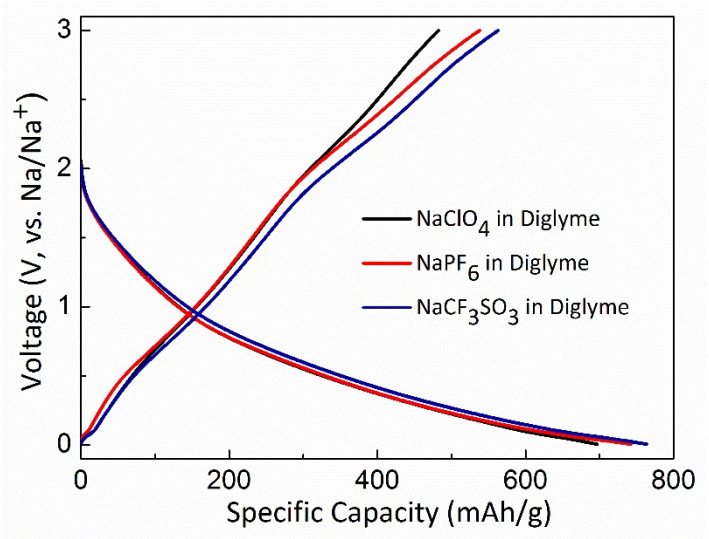

Figure S3 The evaluation of the impact of sodium salts on electrochemical performance.

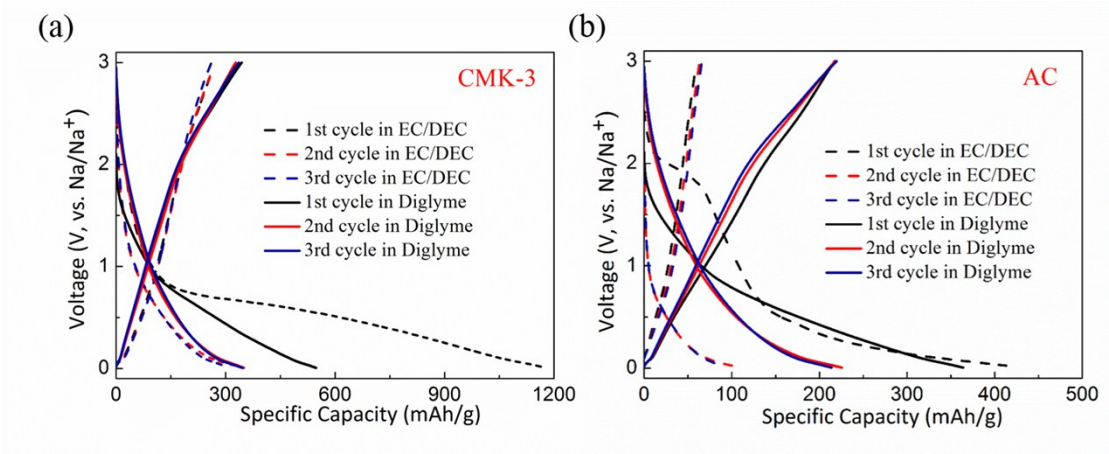

Figure S4 (a) Galvanostatic charge-discharge profiles of the first three cycles of CMK-3 electrodes for NaOTf in EC/DEC and Diglyme at a current density of 0.1 A/g. (b) Galvanostatic charge-discharge profiles of the first three cycles of AC electrodes for NaOTf in EC/DEC and Diglyme at a current density of 0.1 A/g.

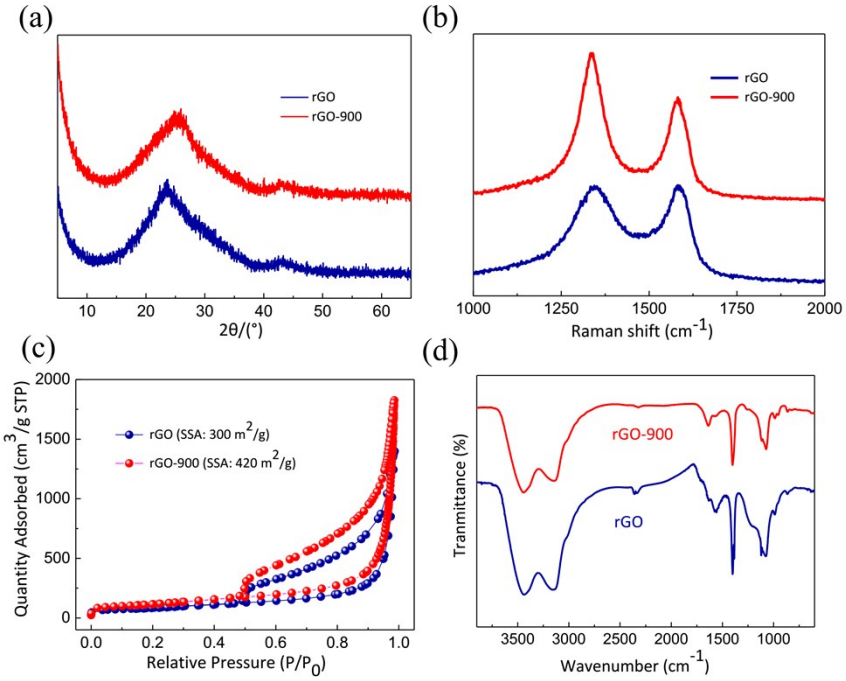

Figure S5 Comparison of structure and surface chemistry between rGO and rGO-900 electrodes in NaOTf in Diglyme. (a) XRD profiles, (b) N_2 adsorption isotherms, (c) Raman spectra and (d) FTIR spectra of rGO and rGO-900

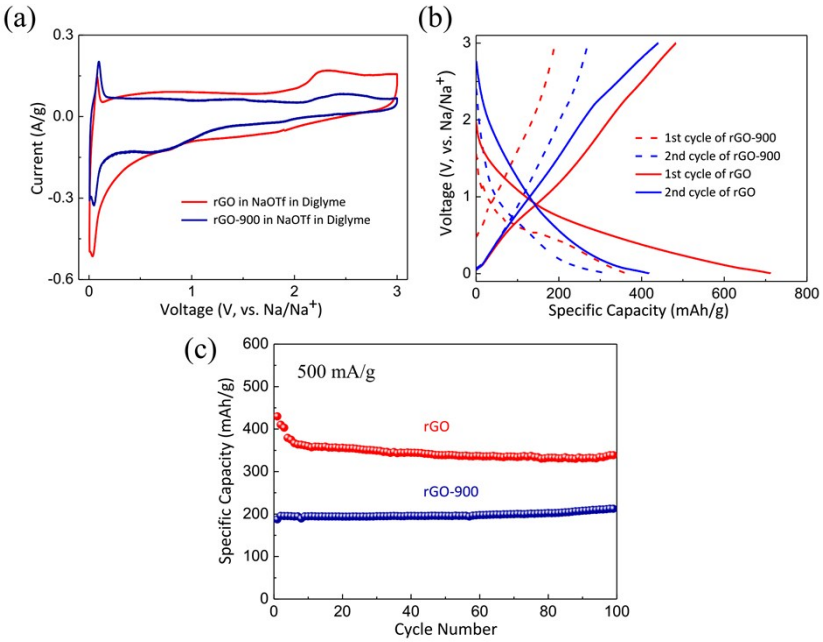

Figure S6 Comparison of electrochemical performance between rGO and rGO-900 electrodes in NaOTf in Diglyme. (a) CV curves of the first cycle for rGO and rGO-900 electrodes in NaOTf in Diglyme at a scanning rate of 0.2 mV/s; (b) Galvanostatic charge-discharge profiles of the first two cycles for rGO and rGO-900 electrodes in NaOTf in Diglyme at a current density of 0.1 A/g; (c) Cycling performance of 100 cycles for rGO and rGO-900 electrodes in NaOTf in Diglyme at 0.5 A/g

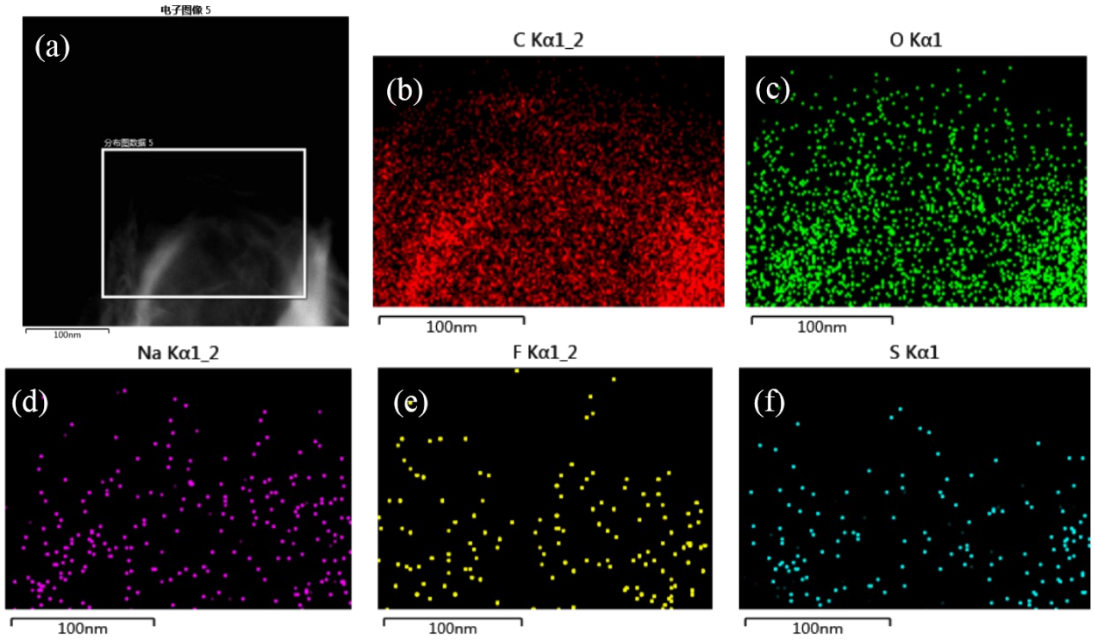

Figure S7 Electron microscopy and elemental analysis of pristine rGO electrodes. (a) STEM image and the corresponding EDS elemental mapping showing the spatial distribution of (b) carbon, (c) oxygen, (d) sodium, (e) fluorine and (f) sulfur.

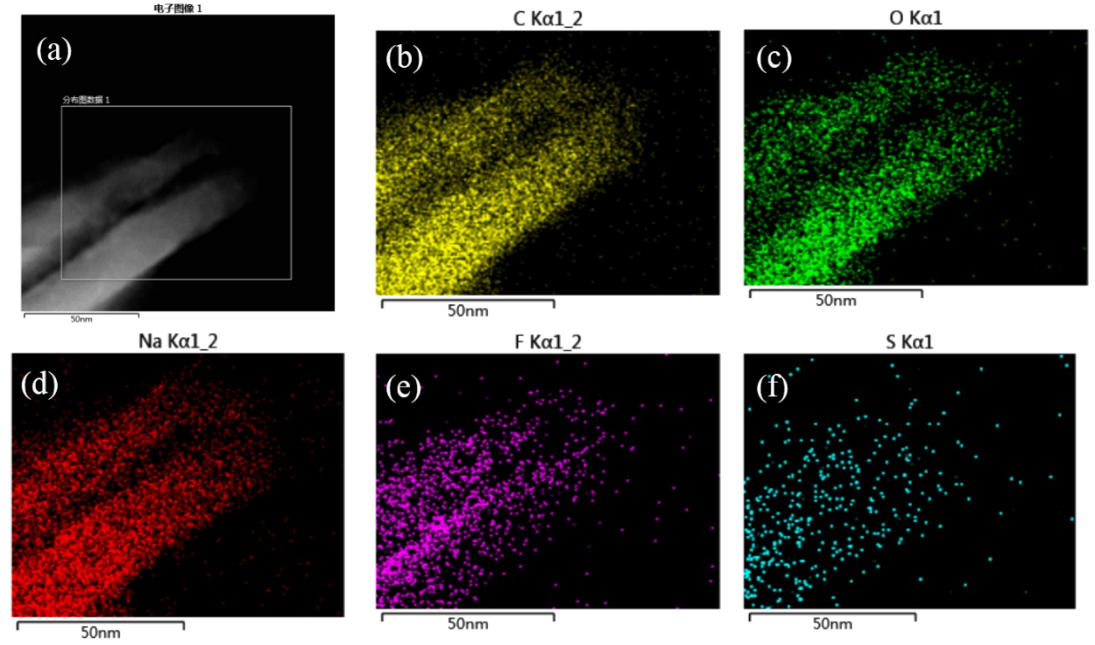

Figure S8 Electron microscopy and elemental analysis of rGO electrodes cycled in Diglyme. (a) STEM image and the corresponding EDS elemental mapping showing the spatial distribution of (b) carbon, (c) oxygen, (d) sodium, (e) fluorine and (f) sulfur.

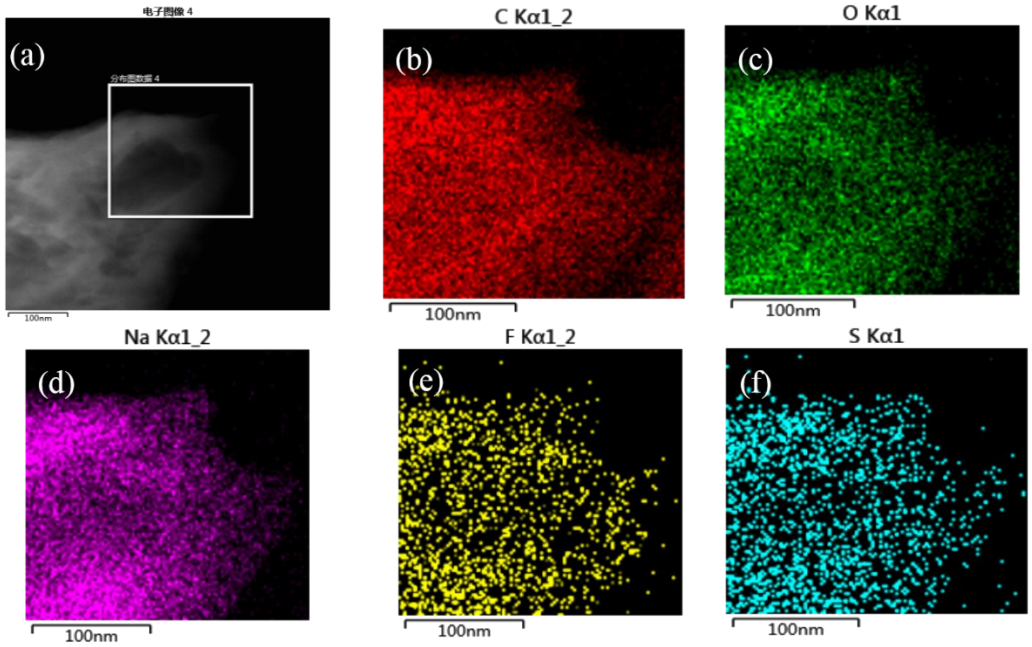

Figure S9 Electron microscopy and elemental analysis of rGO electrodes cycled in EC/DEC. (a) STEM image and the corresponding EDS elemental mapping showing the spatial distribution of (b) carbon, (c) oxygen, (d) sodium, (e) fluorine and (f) sulfur.

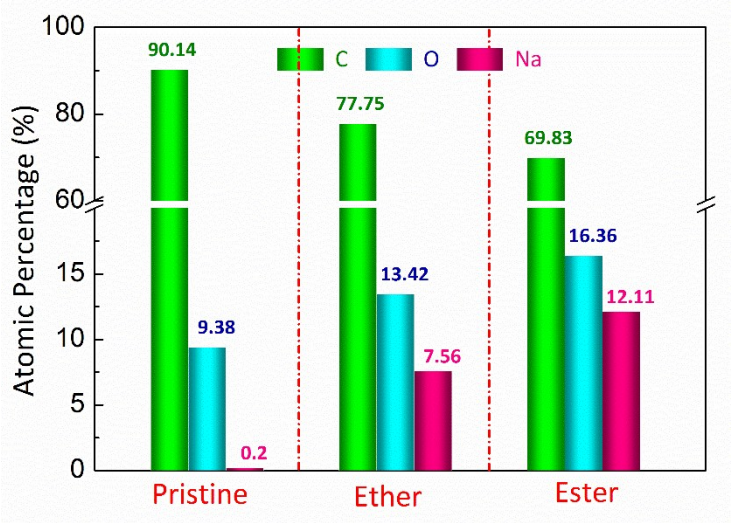

Figure S10 Atomic percentage comparison of different elements in rGO electrodes cycled in different solvents.

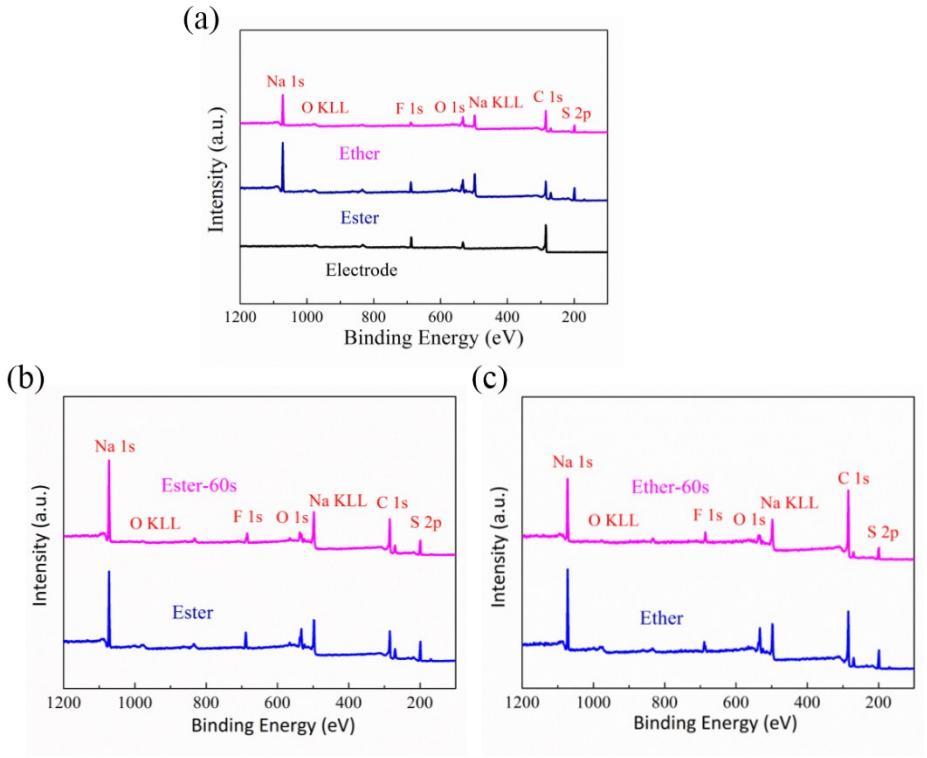

Figure S11 XPS survey spectra of rGO electrodes cycled in different solvents and after etching. XPS survey spectra of (a) pristine rGO electrodes, rGO electrodes cycled in Diglyme and rGO electrodes cycled in EC/DEC; (b) rGO electrodes cycled in EC/DEC and after etching, and (c) rGO electrodes cycled in Diglyme and after etching.

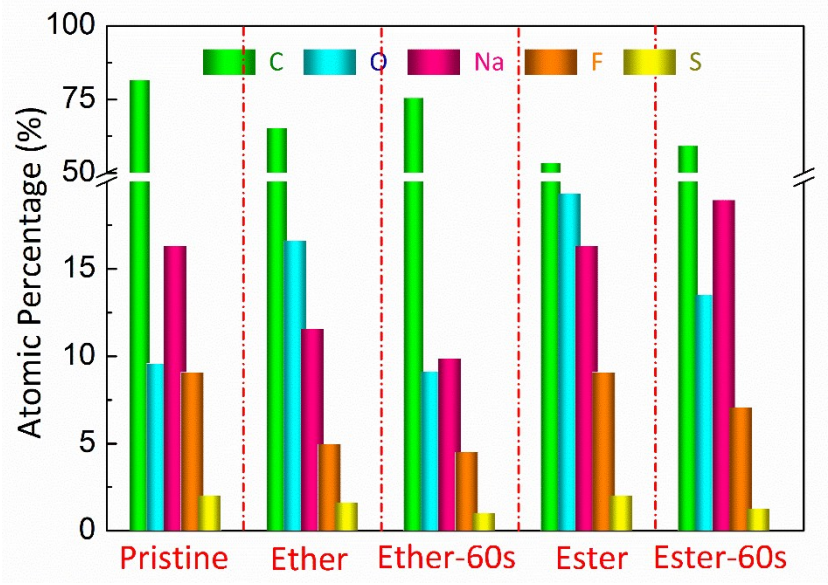

Figure S12 Atomic percentage comparison of different elements in rGO electrodes cycled in different solvents and after etching.

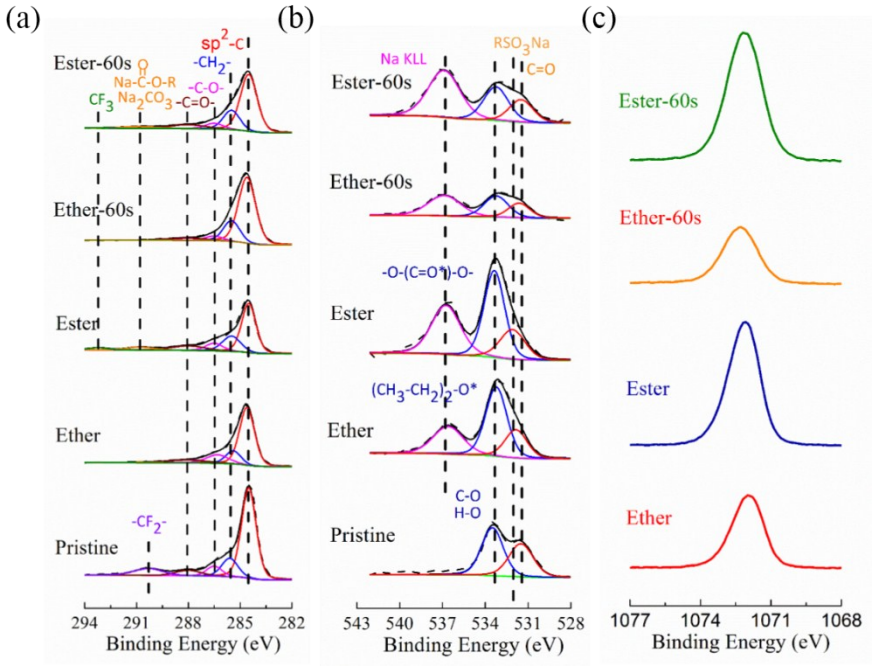

Figure S13 XPS (a) C 1s, (b) O 1s, and (C) Na 1s survey spectra of rGO electrodes cycled in different solvents and after etching.

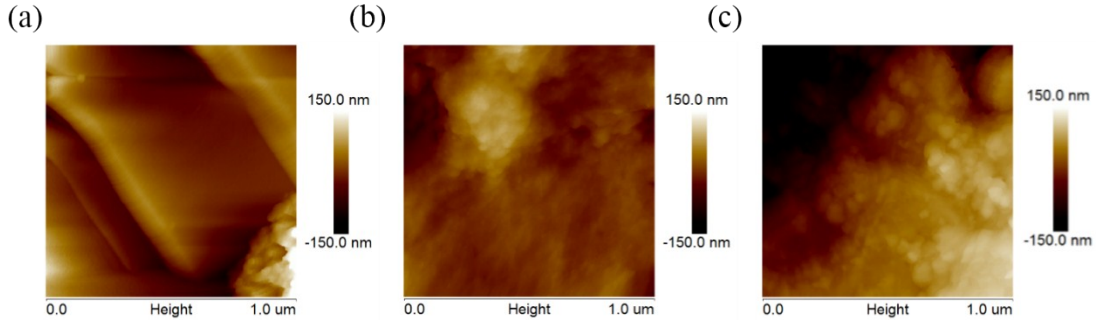

Figure S14 AFM images of rGO electrodes cycled in different solvents. AFM images of (a) pristine rGO electrodes, (b) rGO electrodes cycled in EC/DEC, and (c) rGO electrodes cycled in Diglyme.

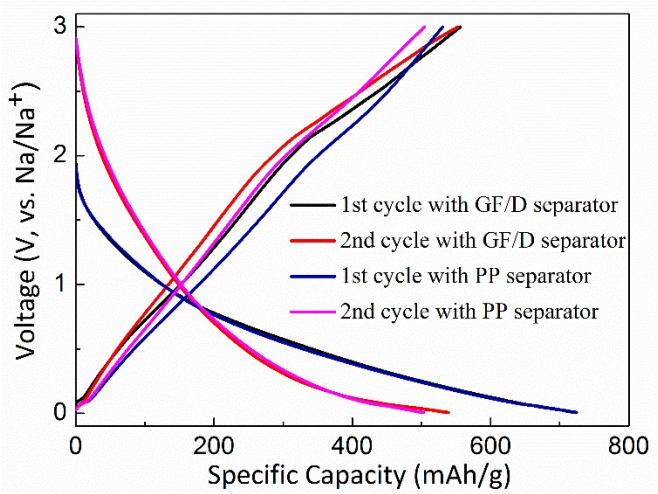

Figure S15 Comparison of electrochemical performance with different separators.