Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting Information

Mixed ether solvent provides long cycle life with high rate capability to graphite anode for Na-ion battery

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Supporting information contents

Figure S7 Depth profiles of C, O, F, Na, and Cu (black, red, orange, blue, and gray circles, respectively) in the graphite electrode after 10000 cycles with various solvents. (a) G1/G2 = 7/3, (b) G1/G2 = 3/7, and (c) G2. C1s, O1s, F1s, and Na1s XPS spectra of the graphite electrode using various solvents. (a)-(d) G2, (e)-(h) G1/G2 = 3/7, and (i)-(l) G1/G2 = 7/3. The sputtering rates for the depth profiles were determined to be 8.2 nm min^{-1} as measured on a SiO_2 reference.

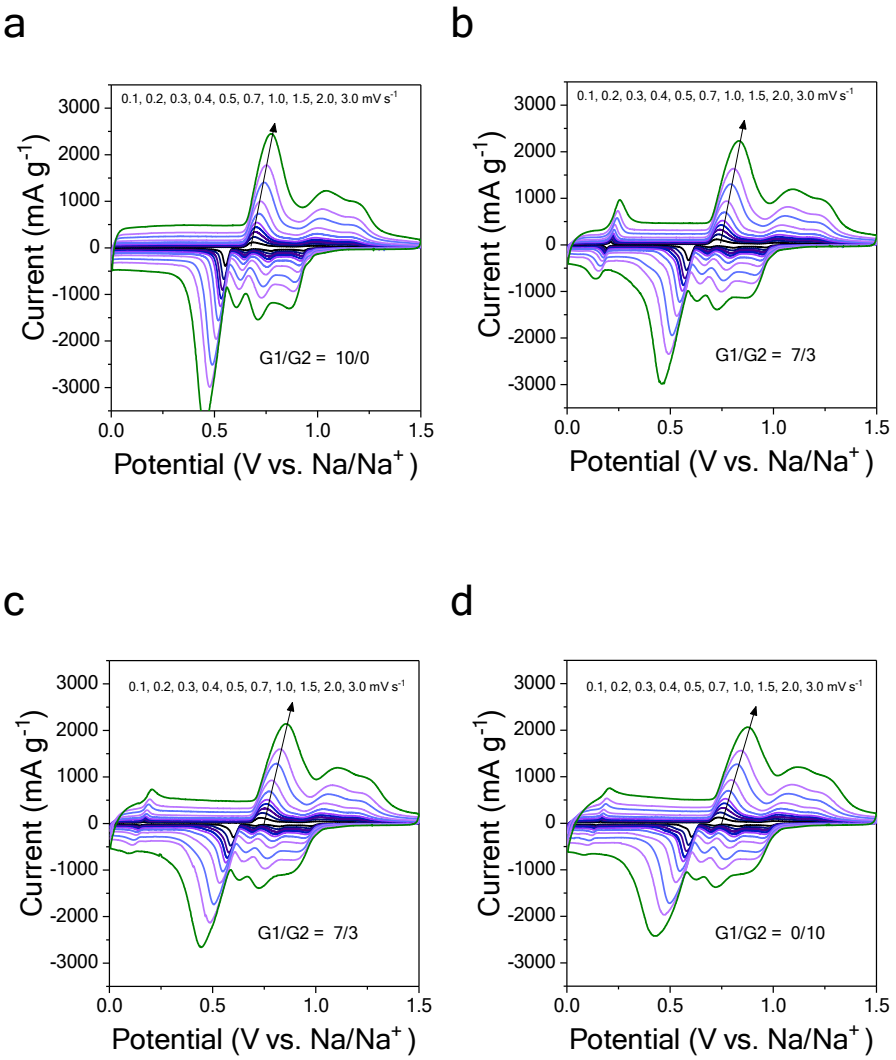
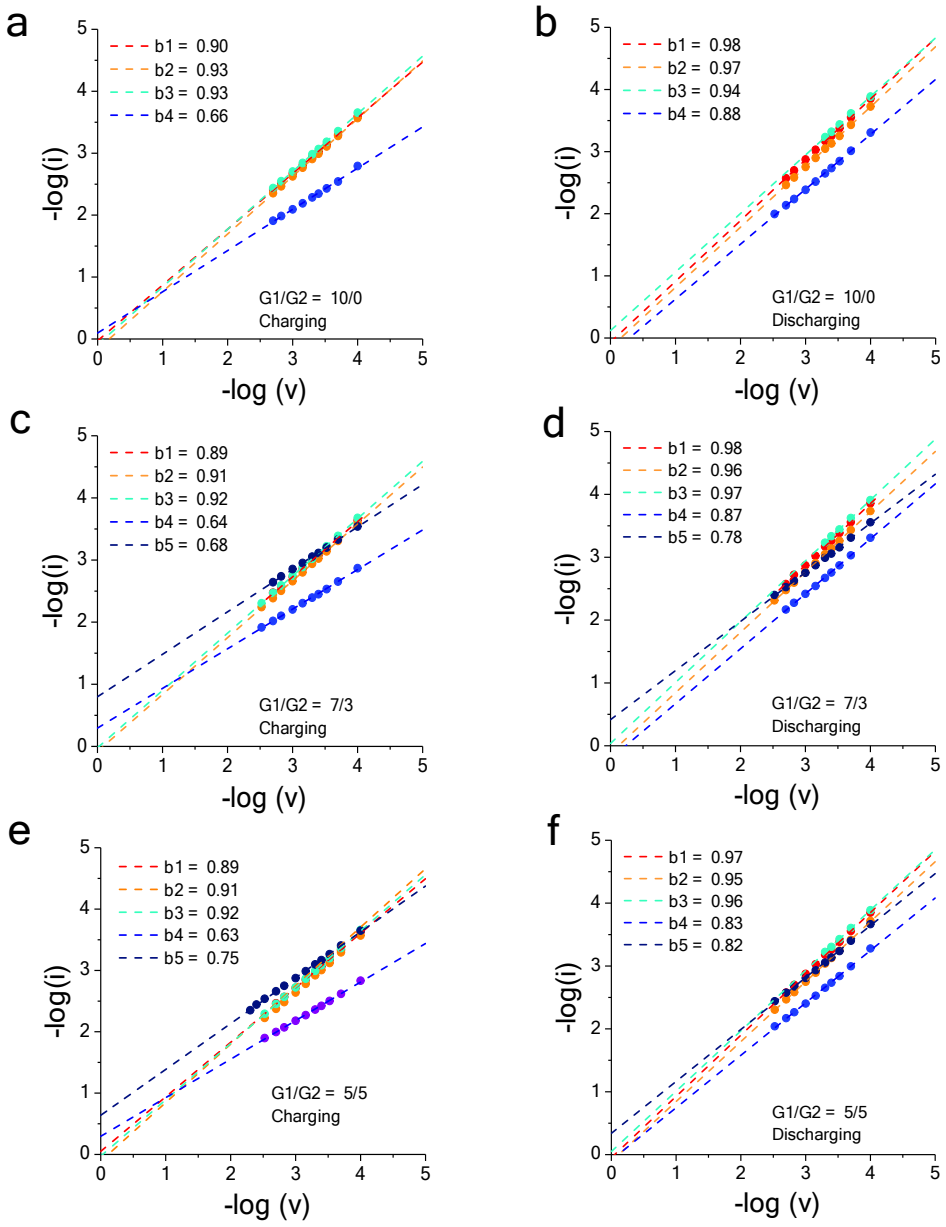


Figure S1 CVs of the graphite anode with various solvents and scan rates. (a) G1, (b) G1/G2 = 7/3, (c) G1/G2 = 3/7, and (d) G2.


a
b1 = 0.90
b2 = 0.93
b3 = 0.93
b4 = 0.66
G1/G2 = 10/0
Charging
-log(i)
-log (v)
b
b1 = 0.98
b2 = 0.97
b3 = 0.94
b4 = 0.88
G1/G2 = 10/0
Discharging
-log(i)
-log (v)
c
b1 = 0.89
b2 = 0.91
b3 = 0.92
b4 = 0.64
b5 = 0.68
G1/G2 = 7/3
Charging
-log(i)
-log (v)
d
b1 = 0.98
b2 = 0.96
b3 = 0.97
b4 = 0.87
b5 = 0.78
G1/G2 = 7/3
Discharging
-log(i)
-log (v)
e
b1 = 0.89
b2 = 0.91
b3 = 0.92
b4 = 0.63
b5 = 0.75
G1/G2 = 5/5
Charging
-log(i)
-log (v)
f
b1 = 0.97
b2 = 0.95
b3 = 0.96
b4 = 0.83
b5 = 0.82
G1/G2 = 5/5
Discharging
-log(i)
-log (v)

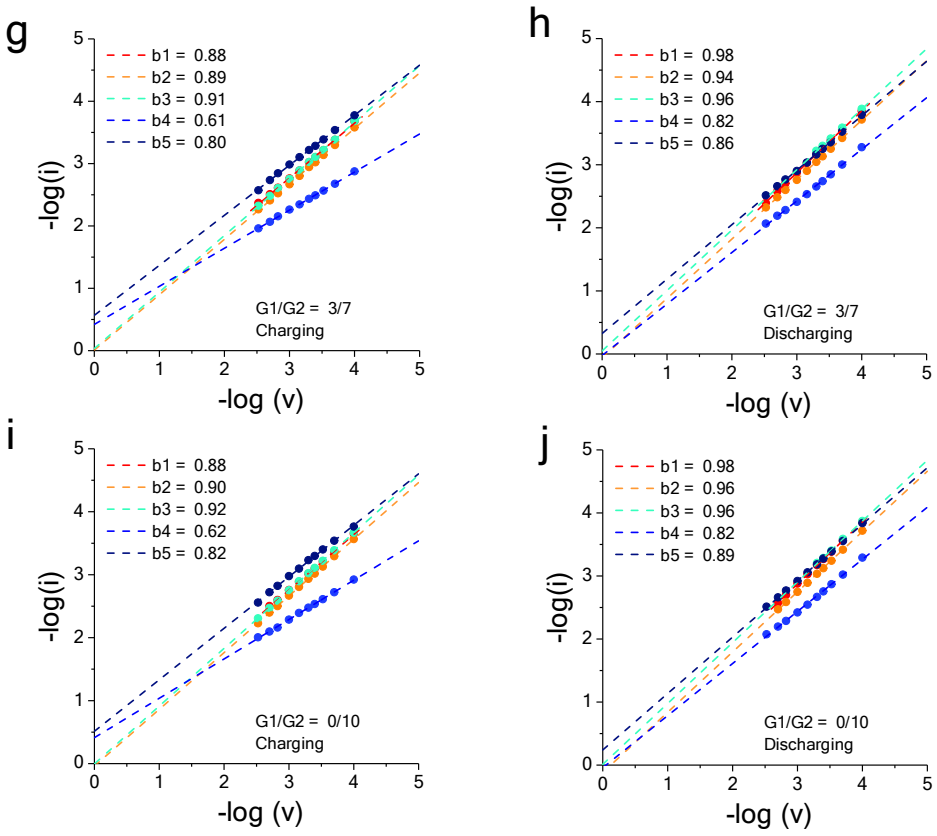


Figure S2 Log i (peak current) vs. log υ (scan rate) plots during charge-discharge with various solvents from the CVs. (a) G1 at charging, (b) G1 at discharging, (c) G1/G2 = 7/3 at charging, (d) G1/G2 = 7/3 at discharging, (e) G1/G2 = 5/5 at charging, (f) G1/G2 = 5/5 at discharging, (g) G1/G2 = 3/7 at charging, (h) G1/G2 = 3/7 at discharging, (i) G2 at charging, and (j) G2 at discharging.

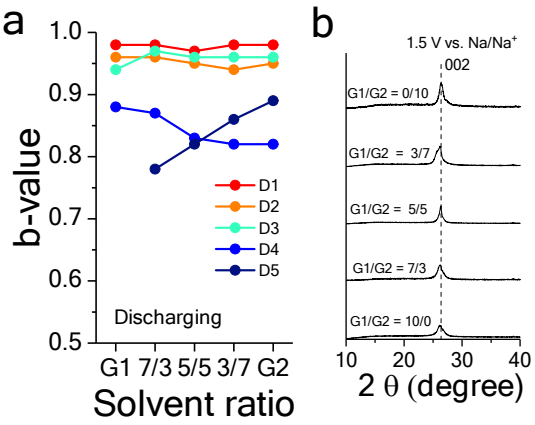


Figure S3 (a) b-values of discharging, (b) XRD patterns of first discharge state.

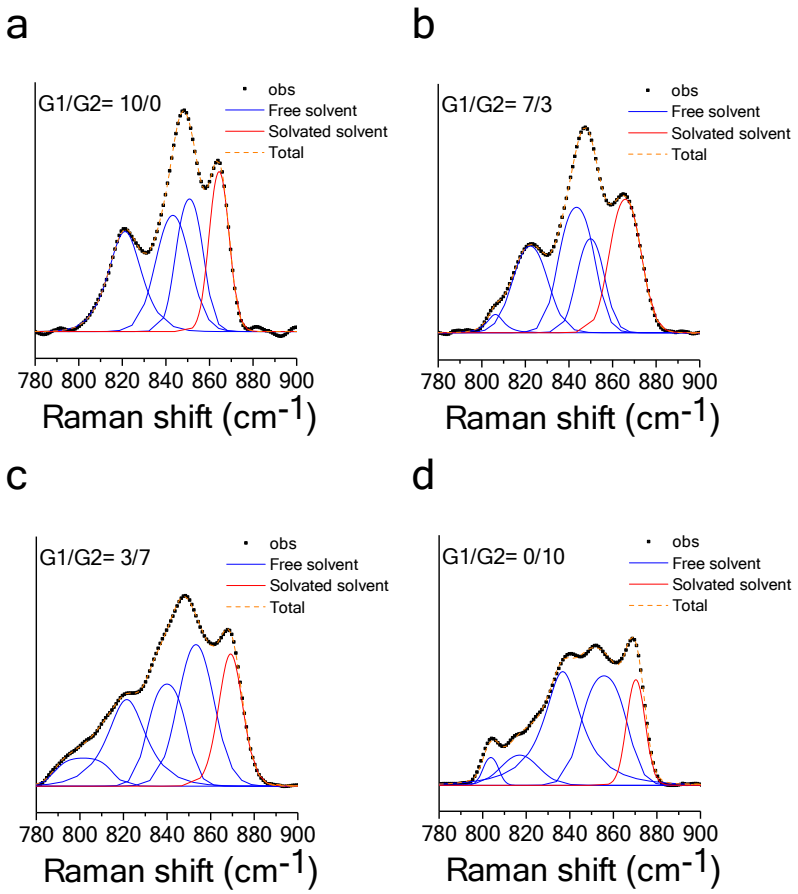


Figure S4 Raman spectra of electrolytes with various solvents. The deconvoluted bands shown in blue and red correspond to solvated and free ether, respectively. (a) G1, (b) G1/G2 = 7/3, (c) G1/G2 = 5/5, (d) G1/G2 = 3/7, and (e) G2.

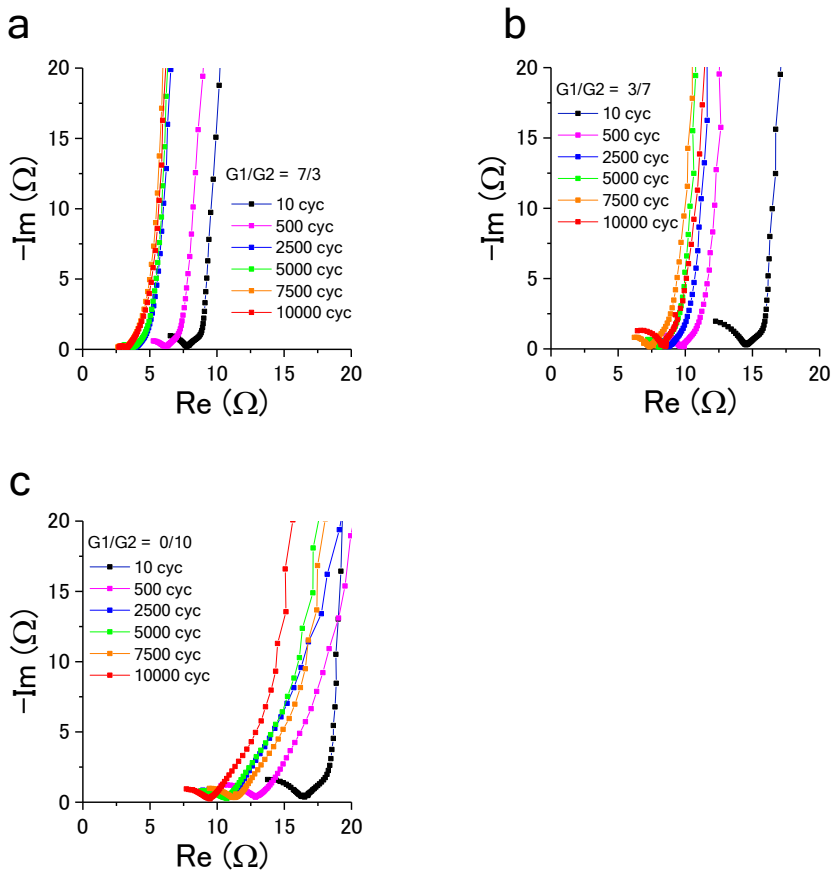


Figure S5 Nyquist plots of cell with various solvents at the discharge state after various cycles. (a) G2, (b) G1/G2 = 3/7, and (c) G1/G2 = 7/3.

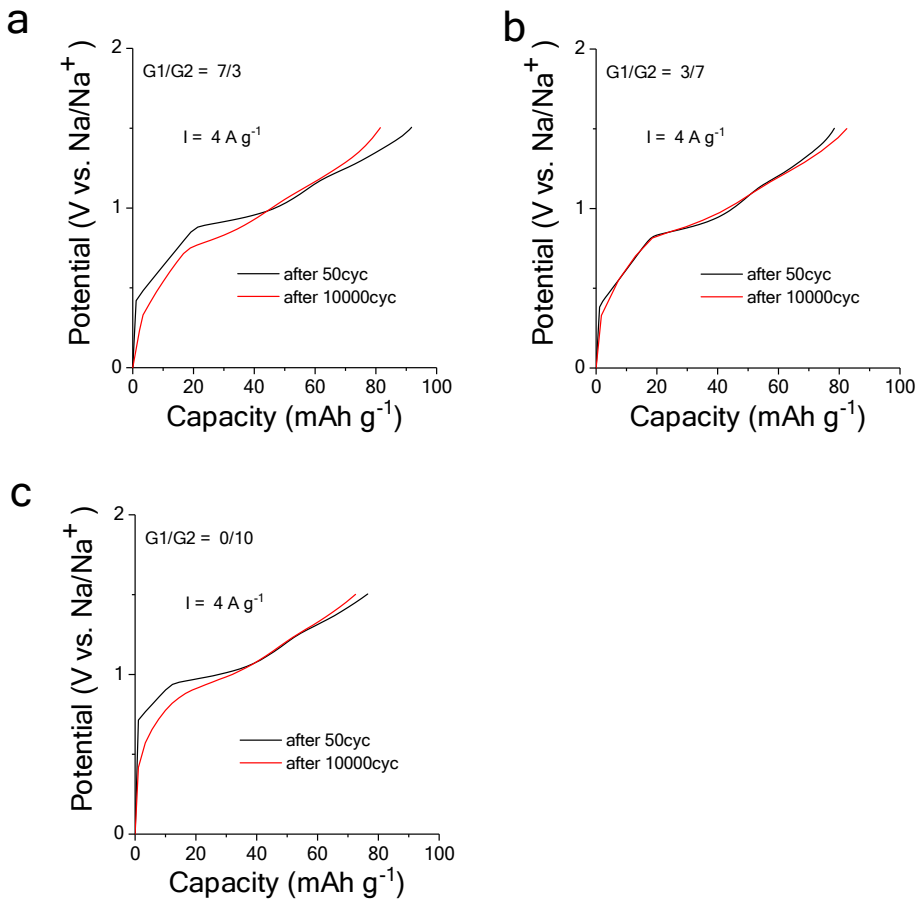


Figure S6 Discharge curves at the current rate of 4.0 A g^{-1} after 50 and 10000 cycles with various solvents. (a) G1/G2 = 7/3, (b) G1/G2 = 3/7, and (c) G2.

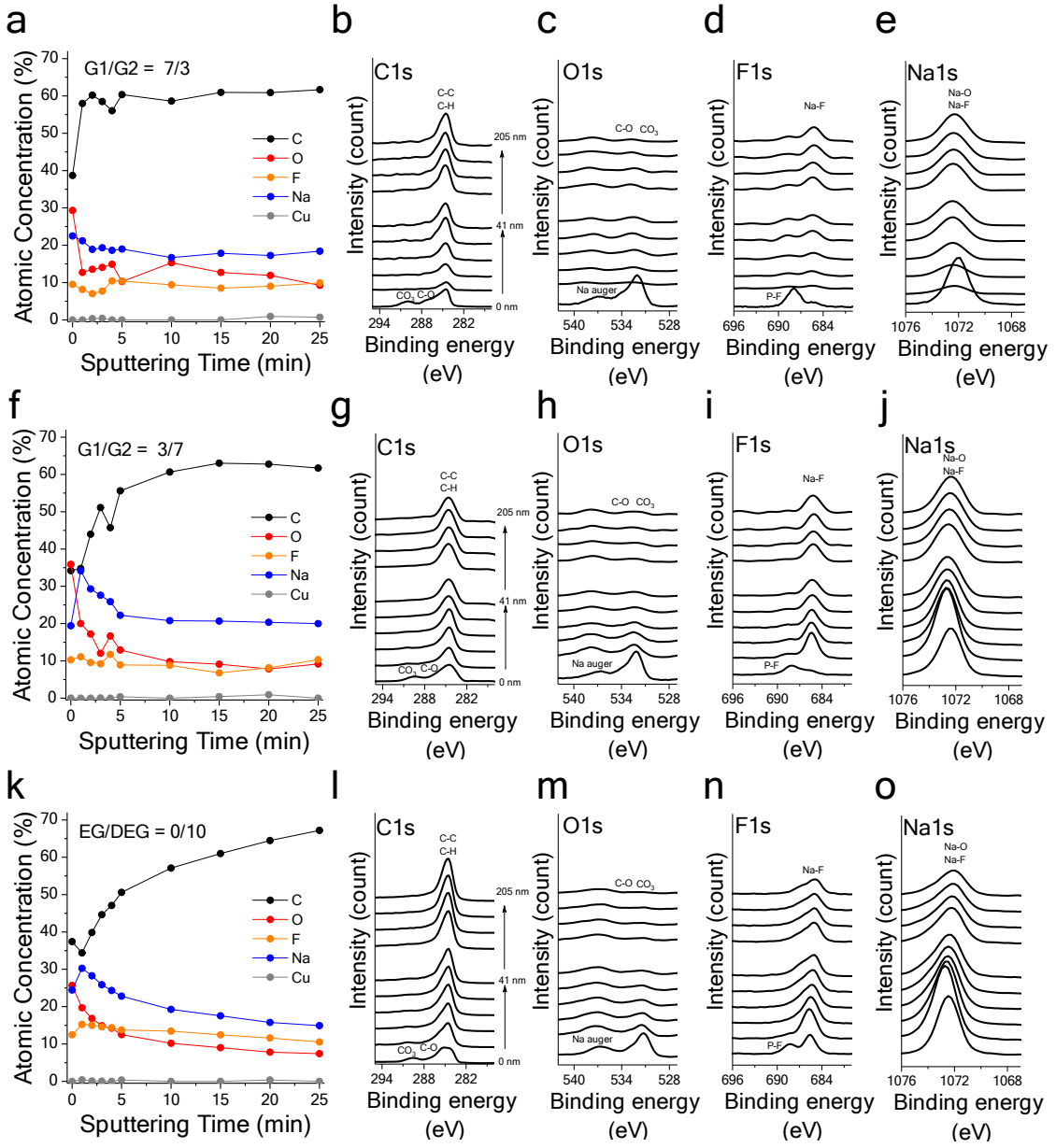


Figure S7 Depth profiles of C, O, F, Na, and Cu (black, red, orange, blue, and gray circles, respectively) in the graphite electrode after 10000 cycles with various solvents. (a) G1/G2 = 7/3, (b) G1/G2 = 3/7, and (c) G2. C1s, O1s, F1s, and Na1s XPS spectra of the graphite electrode using various solvents. (a)-(d) G2, (e)-(h) G1/G2 = 3/7, and (i)-(l)

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