Supporting Information

Graphite Particles Modified by ZnO Atomic Layer Deposition for Li-ion Battery Anodes

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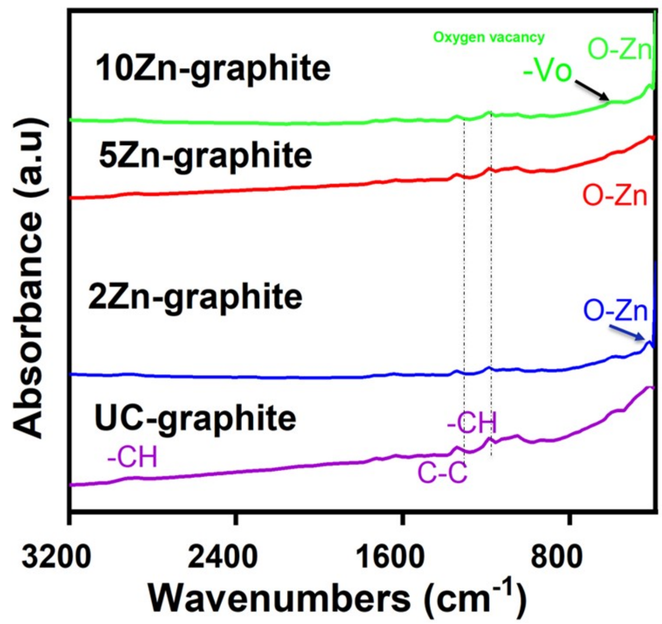

Fig. S1. FTIR spectra of pristine graphite particles and graphite particles coated with various number of ZnO ALD cycles.

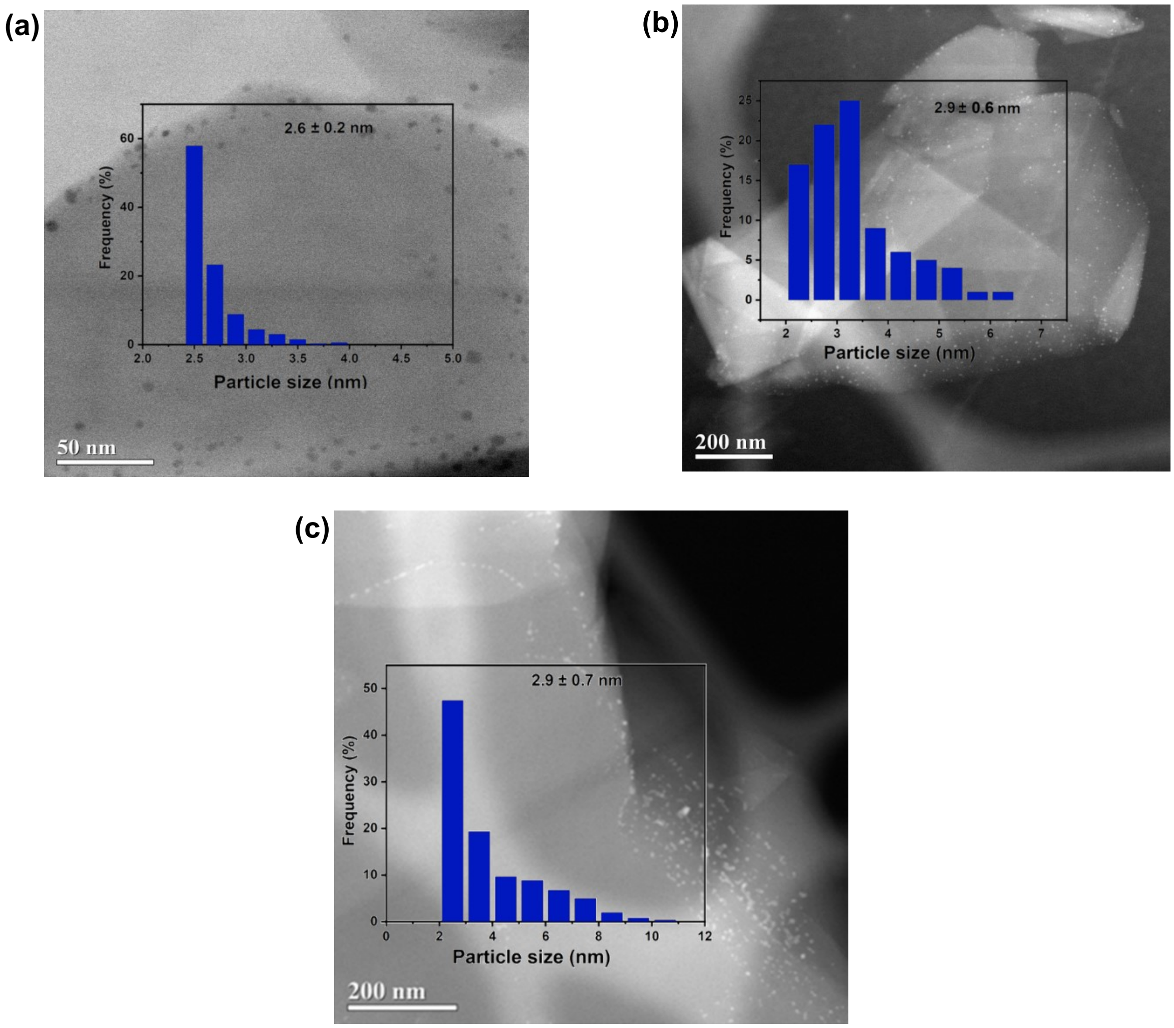

Fig. S2. TEM images of (a) 2Zn-graphite powders, (b) 5Zn-graphite powders, and (c) 10Zn-graphite powders. The inset image shows the size distributions of ZnO nanoparticles.

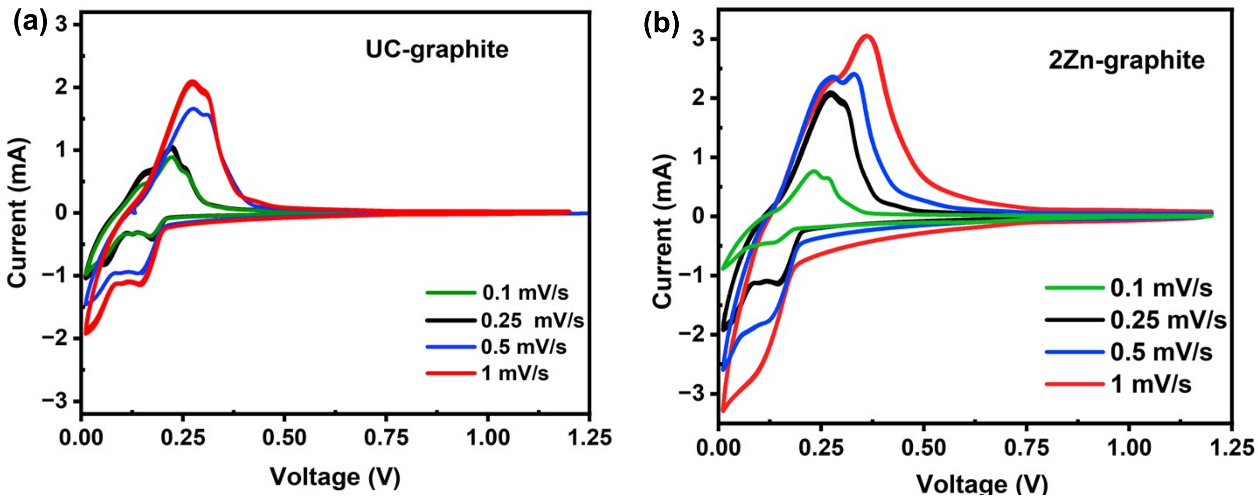

Fig. S3. The first cycle of the CV profile at various scan rates for (a) UC-graphite anode (b) 2Zn-graphite anode.

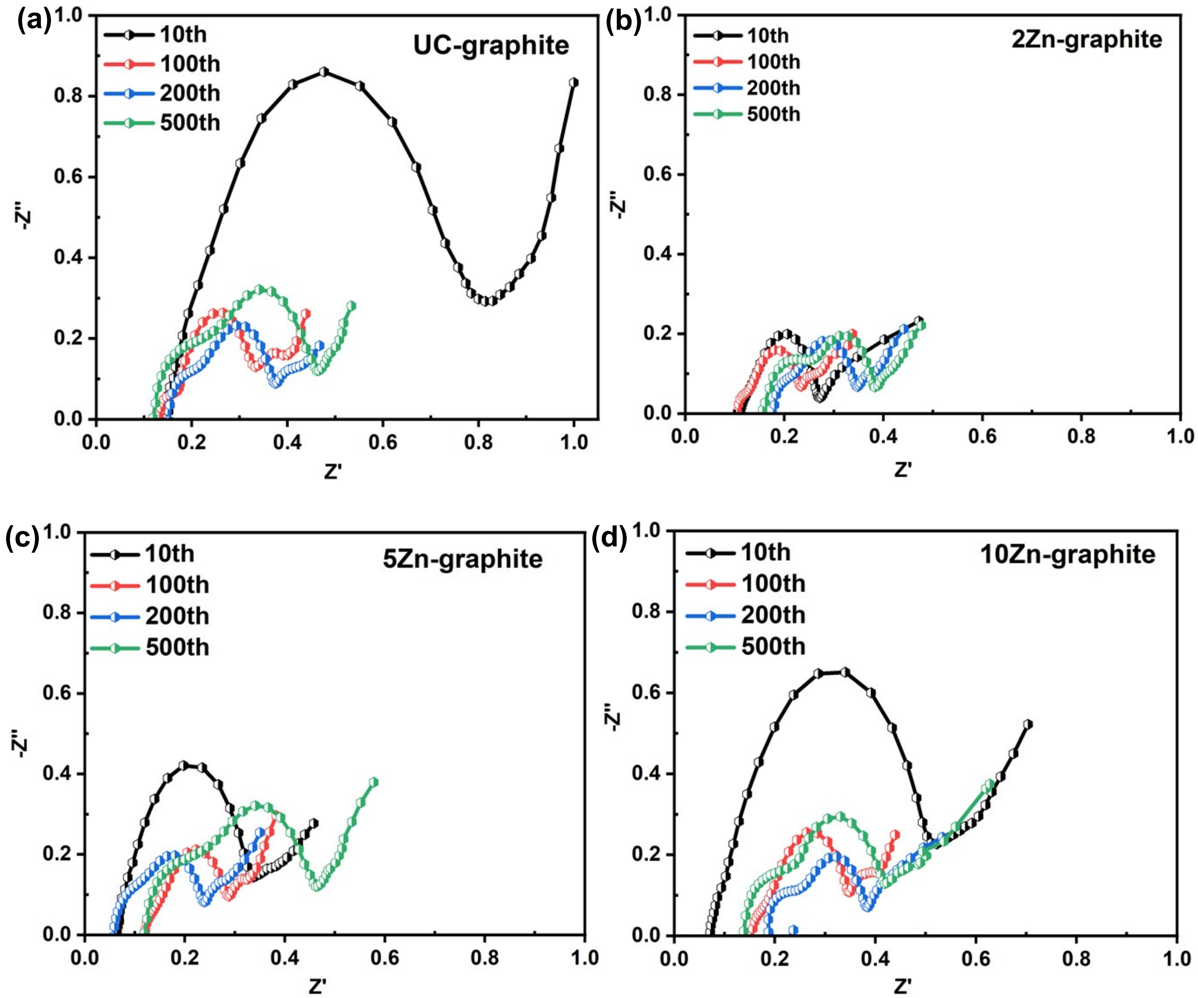

Fig. S4. After normalization, the Nyquist plot of anode samples tested at a 1C rate with a potential range of 0.1 V - 3.0 V for the 10th, 100th, 200th, and 500th charge/discharge cycles for (a) UC-graphite, (b) 2Zn-graphite, (c) 5Zn-graphite, and (d) 10Zn-graphite.

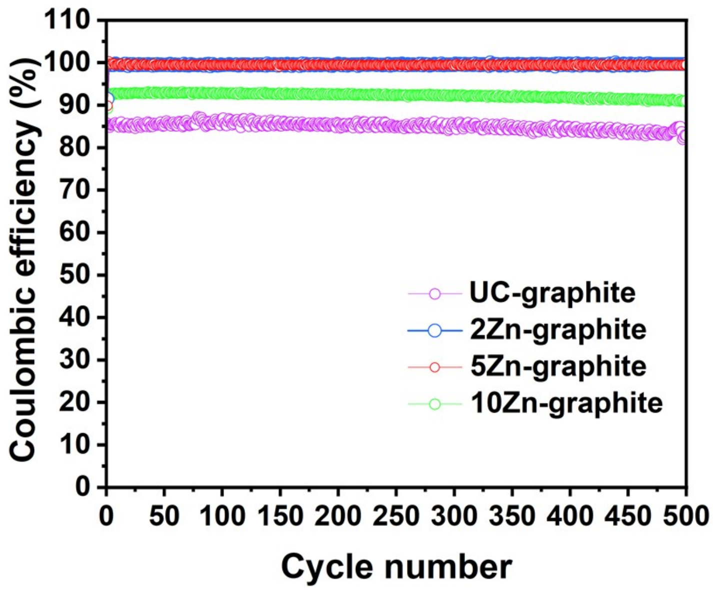

Fig. S5. Coulombic efficiencies of graphite electrodes.

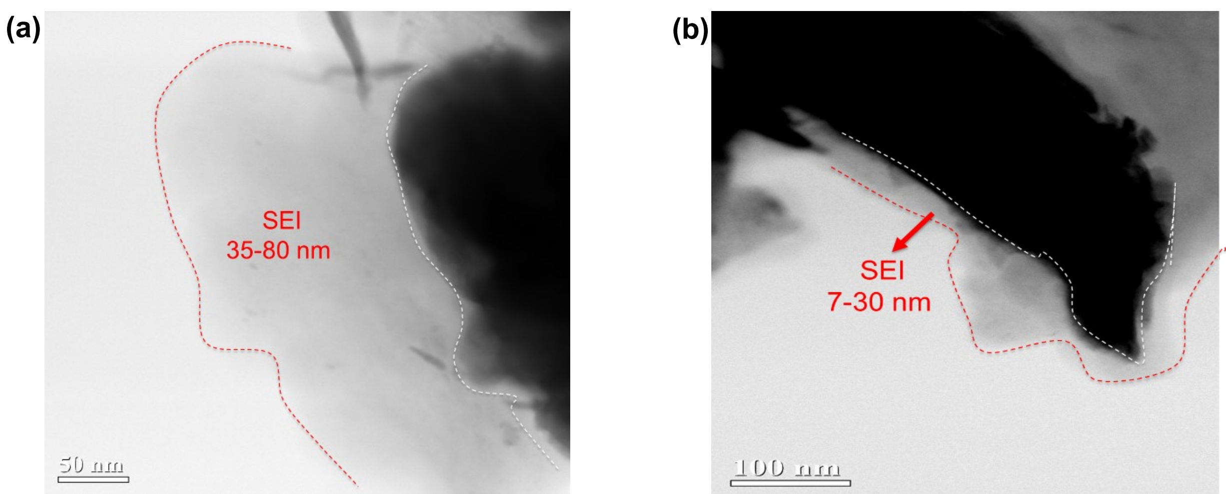

Fig. S6. TEM images of the (a) cycled UC-graphite electrode and (b) cycled 2Zn-graphite electrode after 500 cycles of charge/discharge.

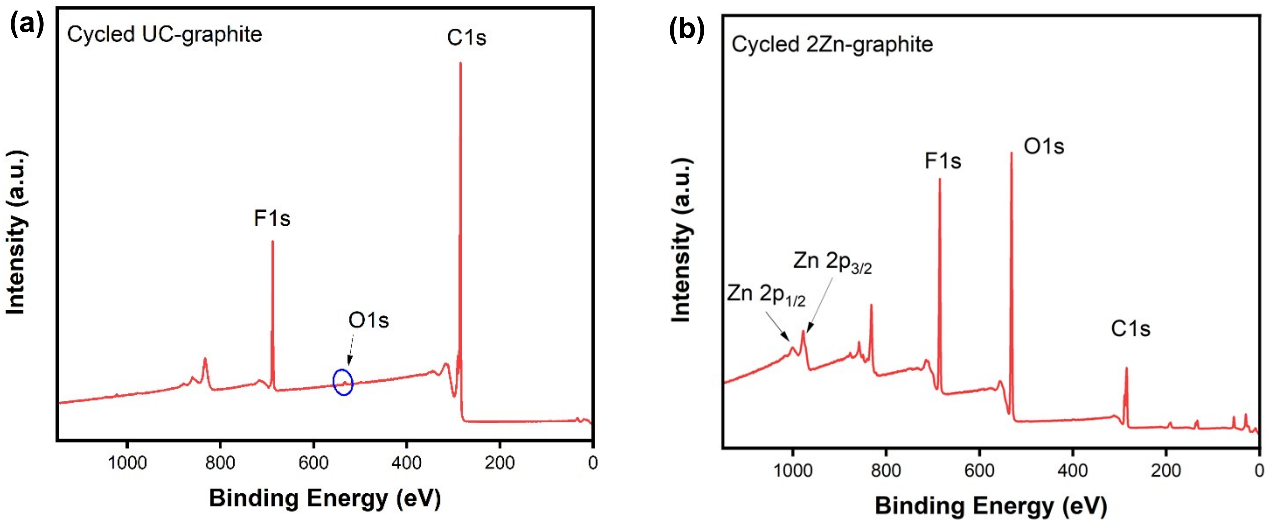

Fig. S7. Scan survey of (a) cycled UC-graphite electrode, and (b) cycled 2Zn-graphite electrode after 100 cycles of charge/discharge.

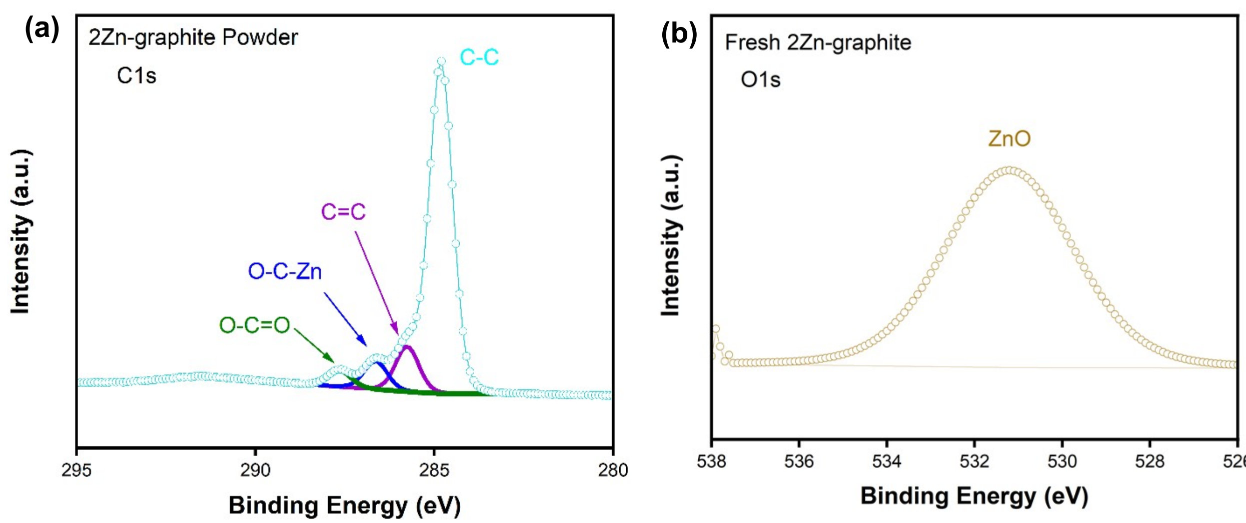

Fig. S8. XPS spectra: (a) C1s of fresh 2Zn-graphite powders, and (b) O1s of fresh 2Zn-electrode.

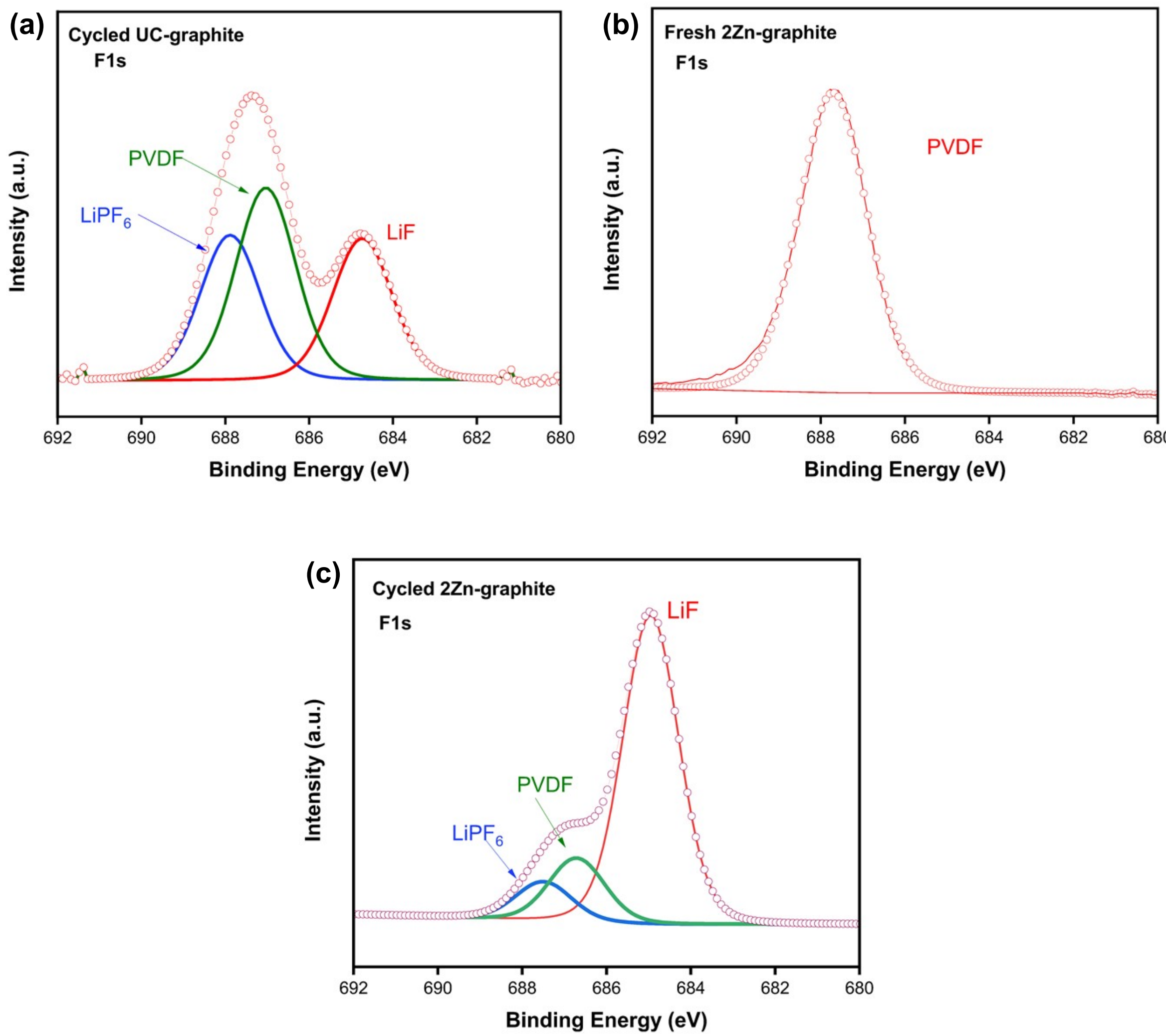

Fig. S9. XPS F1s spectra of (a) cycled UC-graphite, (b) fresh 2Zn-graphite, and (c) cycled 2Zn-graphite.

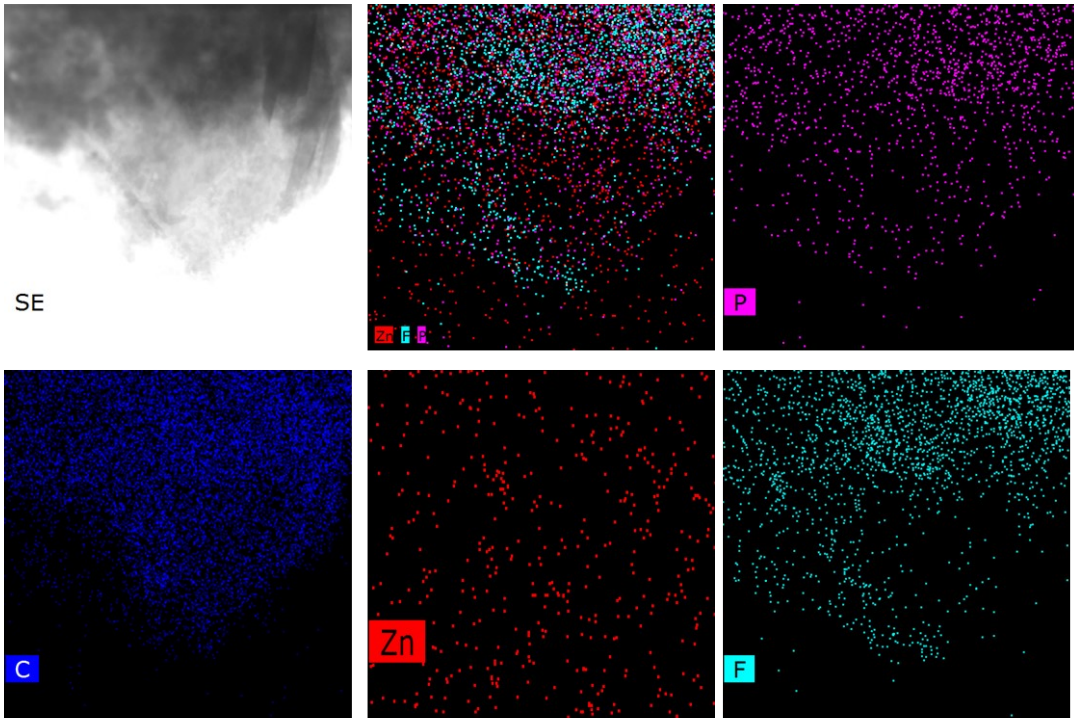

Fig. S10. TEM image and EDX mapping of 2Zn-graphite electrode after 500 cycles of charge/discharge.

Table S1. Comparative analysis of rate performance for 2Zn-graphite and related graphite-based anodes reported in recent studies.

Cell system	Anode structure	Rate Performance ($mAh\ g^{-1}$)	Electrochemical Stability Window (V)	Reference
Graphite // Li	Uncoated graphite	26@5C	0.01-1.5 V	This work
	2Zn-graphite	109@5C		
Graphite // Li	Bare graphite	25@4C 10 @6C	0.01-1.5 V	1
	Aligned graphene array +graphite	75 @4C 50@6C		
Graphite // Li	Bare graphite	50 @ 5C	0-1.5 V	2
	Graphite coated with amorphous carbon	100 @5C		
Graphite // Li	Pristine graphite	90@4C 80@6C	0-1.5 V	3
	P-S-graphite	100@4C 90@6C		
Graphite // Li	Graphite bare	117@2C	0.01-1.2 V	4
	Graphite with heat treatment	145@2C		

References:

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2. Ma Z, Zhuang Y, Deng Y, Song X, Zuo X, Xiao X, et al. From spent graphite to amorphous sp^2+ sp^3 carbon-coated sp^2 graphite for high-performance lithium ion batteries. Journal of Power Sources. 2018;376:91-9.

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