

## Supplementary Information

### Carbon encapsulated 3D hierarchical $\text{Fe}_3\text{O}_4$ spheres as an advanced anode material with long cycle lifetimes for lithium-ion batteries

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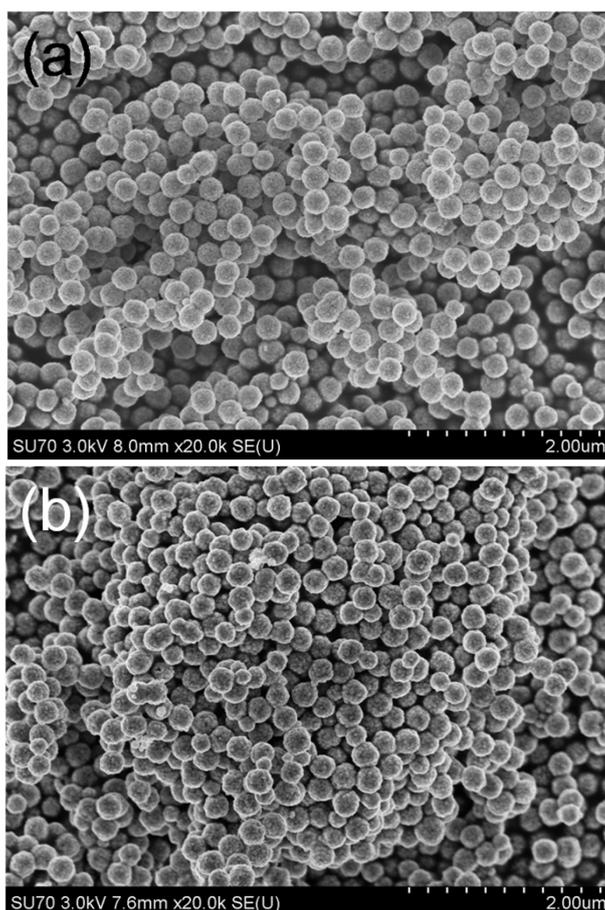


Figure S1 SEM images of  $\text{Fe}_3\text{O}_4$  (a) and  $\text{Fe}_3\text{O}_4@C$  (b) spheres.

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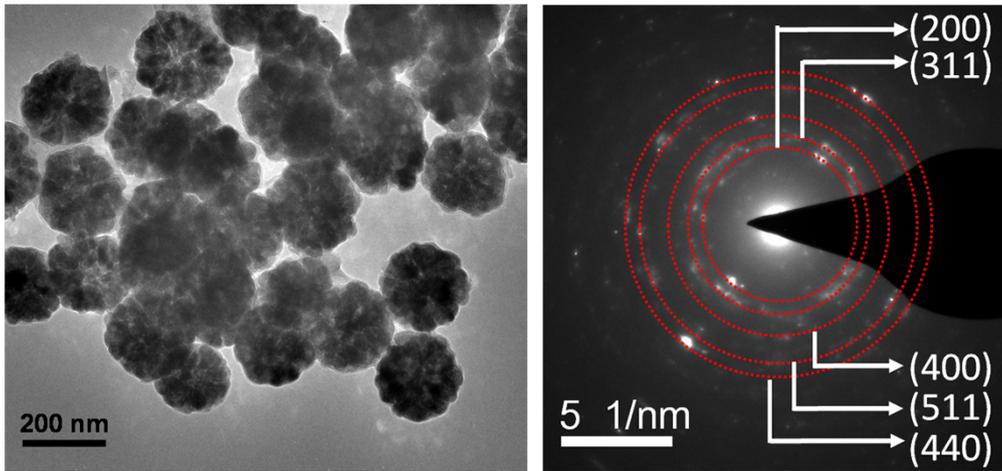


Figure S2 TEM image for the hybrid  $\text{Fe}_3\text{O}_4@\text{C}$  spheres (a) and corresponding SAED patterns (b).

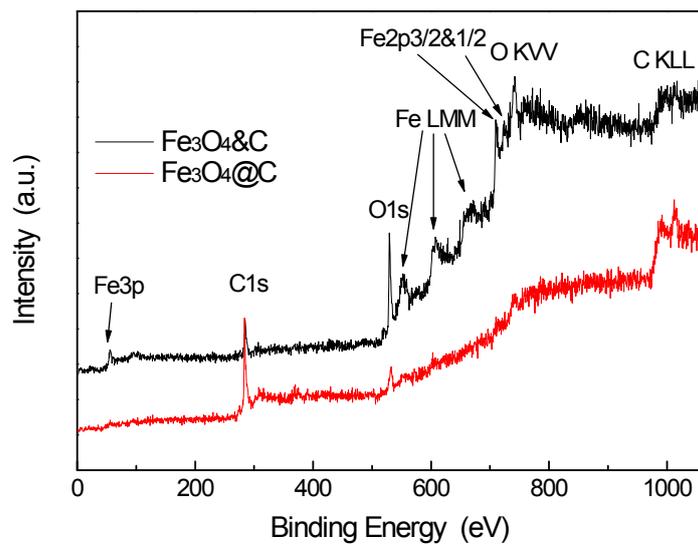


Figure S3. XPS survey scans of mixture of  $\text{Fe}_3\text{O}_4$  nanospheres with graphite (weight, 89:11) and as-prepared hybrid  $\text{Fe}_3\text{O}_4@\text{C}$  composite.

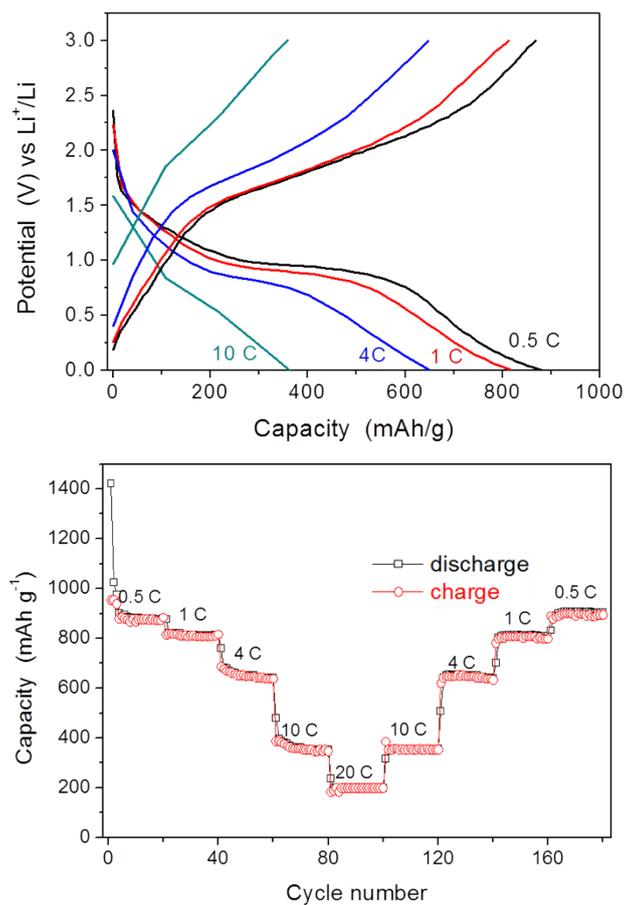


Figure S4. Charge/discharge rate properties of hybrid  $\text{Fe}_3\text{O}_4@\text{C}$  electrode.

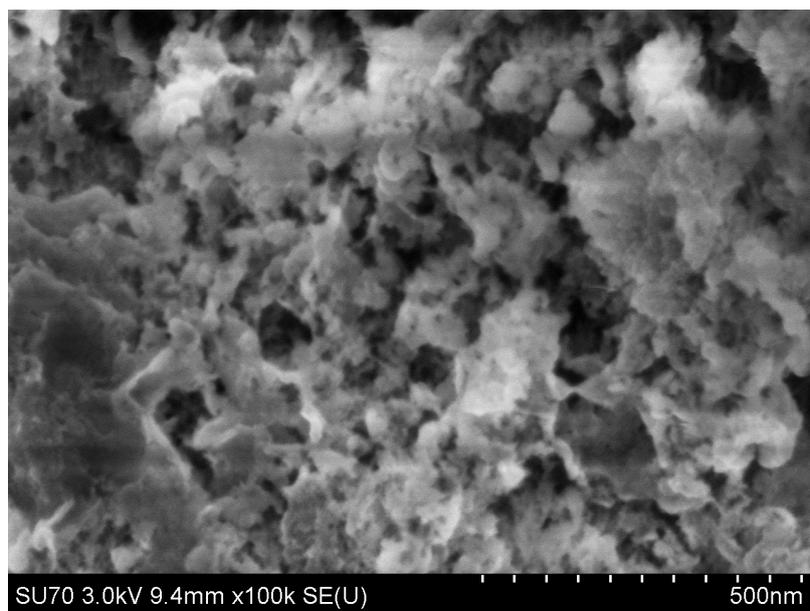


Figure S5. SEM image for bare  $\text{Fe}_3\text{O}_4$  sphere electrode after 50<sup>th</sup> cycles.

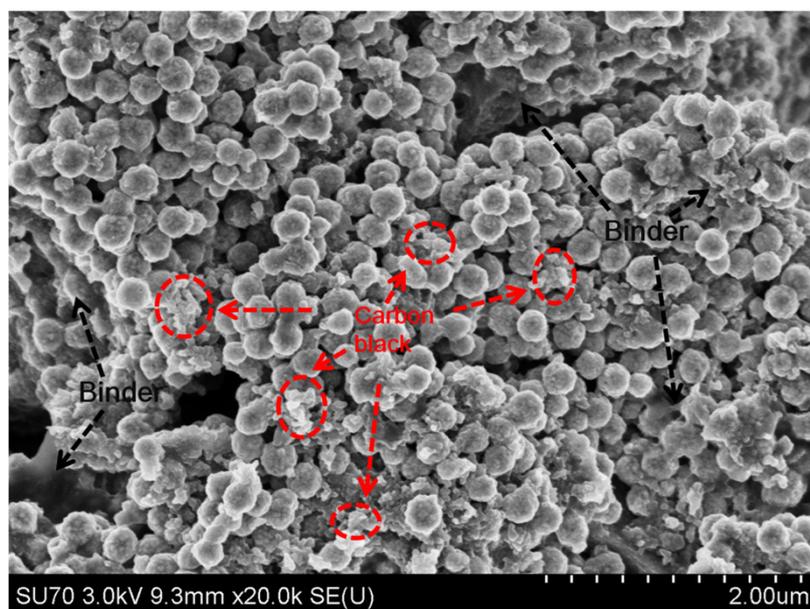


Figure S6 SEM image of the  $\text{Fe}_3\text{O}_4@\text{C}$  electrode in the charged state after 10<sup>th</sup> cycle.

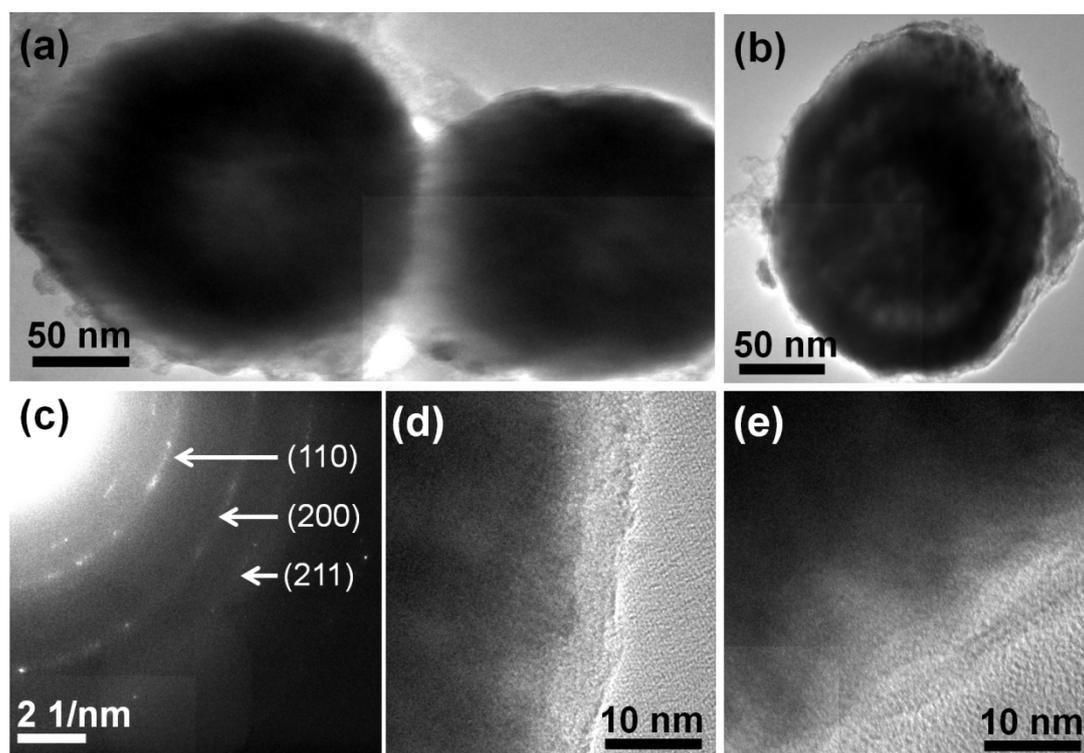


Figure S7 TEM image and the corresponding SAED pattern of the  $\text{Fe}_3\text{O}_4@\text{C}$  electrode in the charged state after 10<sup>th</sup> cycle.

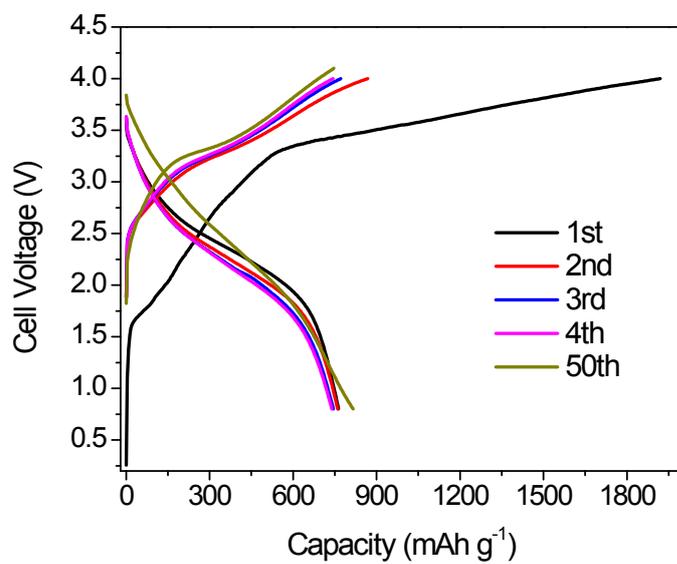


Figure S8 Charge-discharge curves for the full-cell battery with the commercial cathode of  $\text{LiMn}_2\text{O}_4$  and the as-prepared  $\text{Fe}_3\text{O}_4@\text{C}$  as anode