Supporting Information for

Carbon Encapsulated Fe_3O_4 Nanoparticles as a High-Rate Lithium Ion Battery Anode Material

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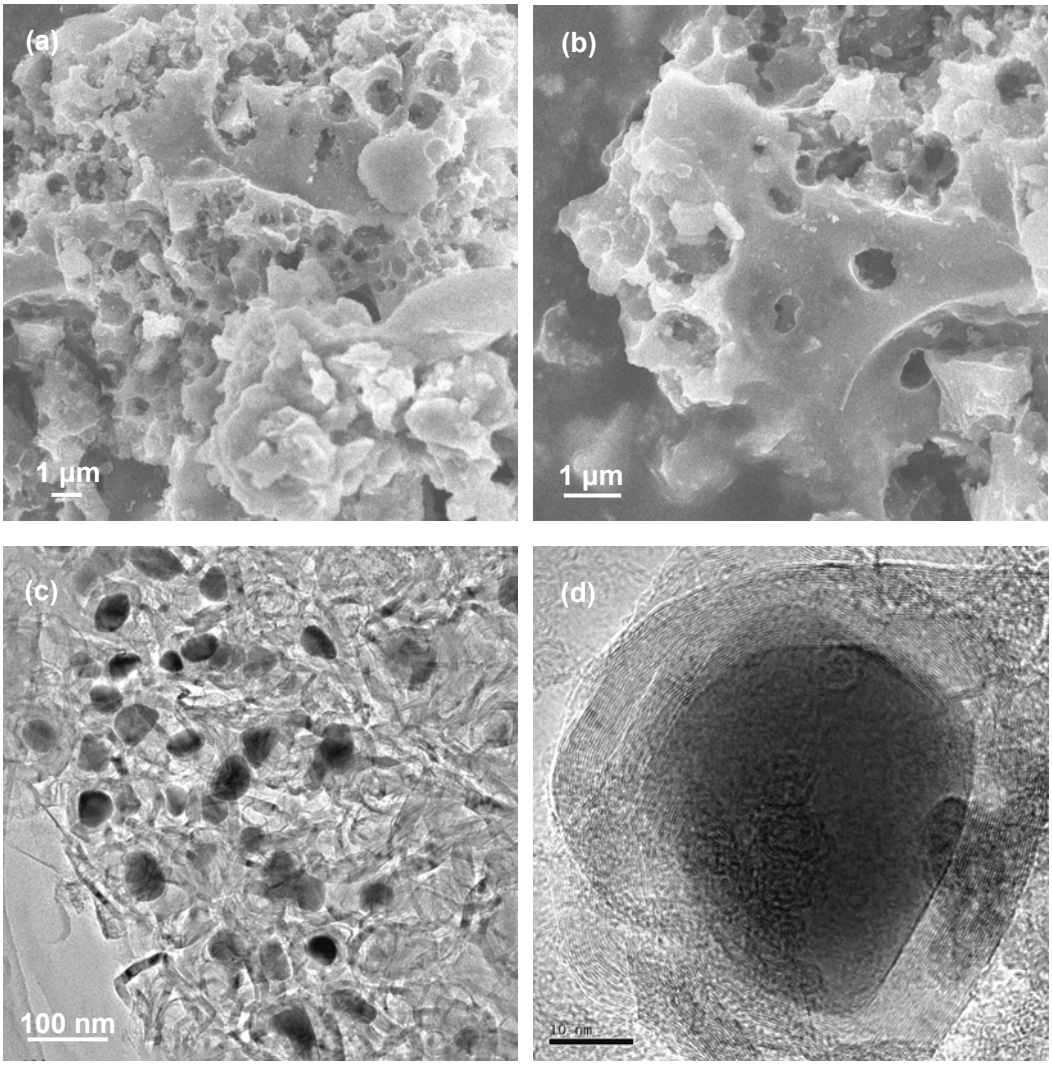

Figure S1. a)-b) SEM images, and c)-d) TEM images of the carbonization products of the mixture ($Fe(NO_3)_3 \cdot 9H_2O$ and $C_6H_{12}O_6$) without NaCl, indicating that a mass of 3D micron-sized carbon blocks with Fe nanoparticles embedded exist in the products.

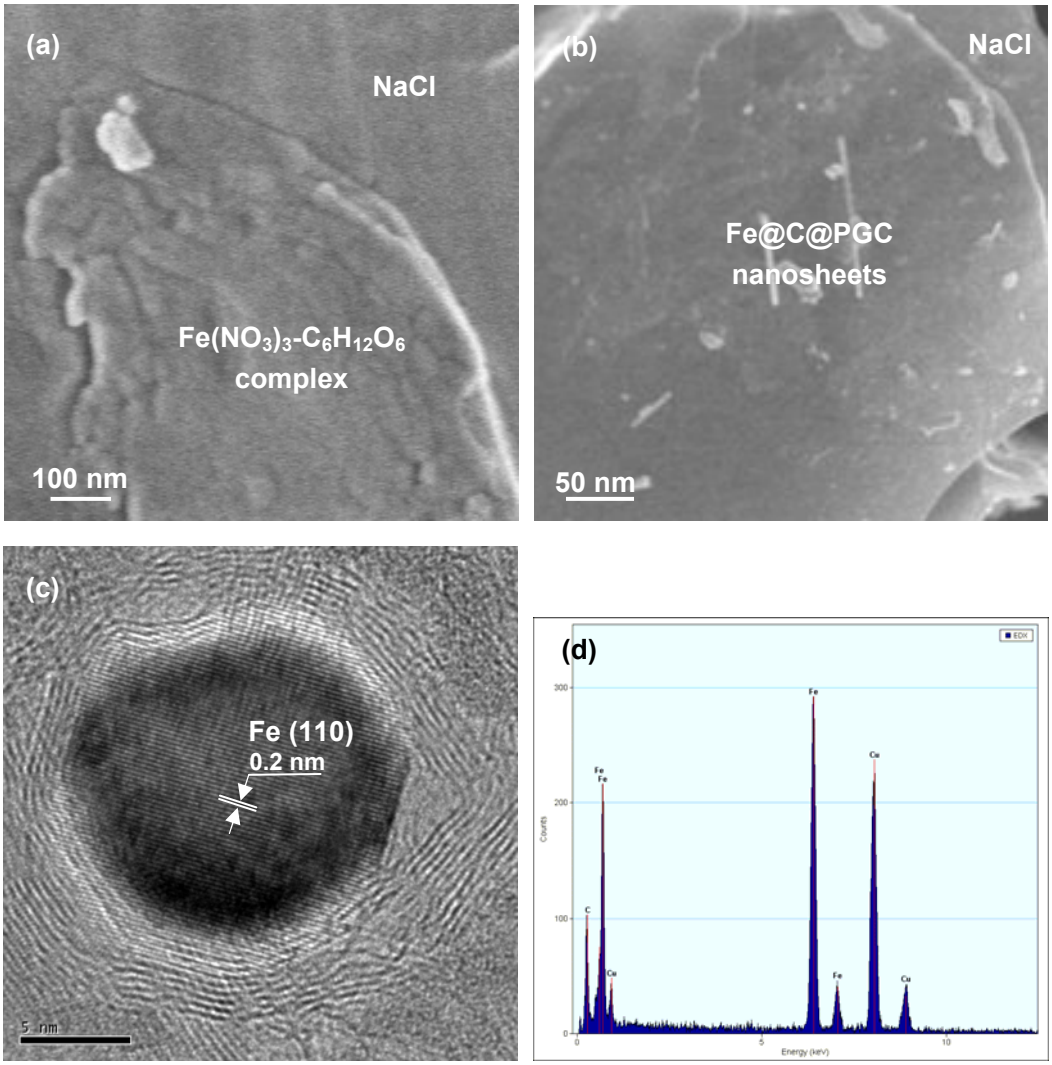

Figure S2. a) SEM image of the fine composite powder containing NaCl, glucose and $Fe(NO_3)_3 \cdot 9H_2O$, indicating that $Fe(NO_3)_3$-$C_6H_{12}O_6$ complex was evenly coated on the surface of NaCl particles. b) SEM image of as-synthesized products before removing the NaCl, suggesting that the 2D Fe@C@PGC nanosheets were actually formed on the NaCl surface. c) HRTEM image, and d) Energy-dispersive X-ray pattern of a typical Fe nanoparticle encapsulated by onion-like carbon shell.

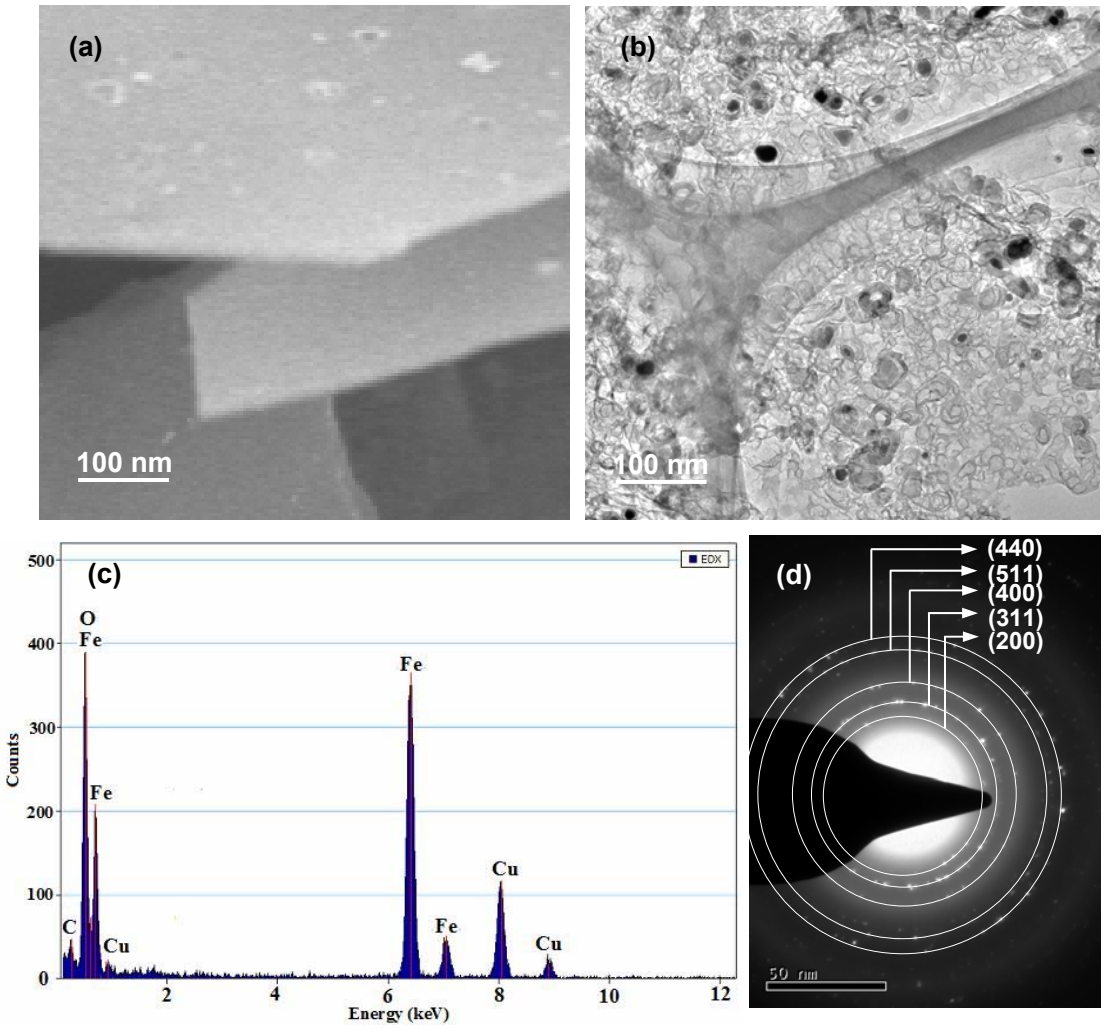

Figure S3. a) HRTEM image and b) SEM image of 2D Fe_3O_4@C@PGC nanosheets. c) Energy-dispersive X-ray pattern and d) SAED pattern of a typical Fe_3O_4 nanoparticle encapsulated by onion-like carbon shell.

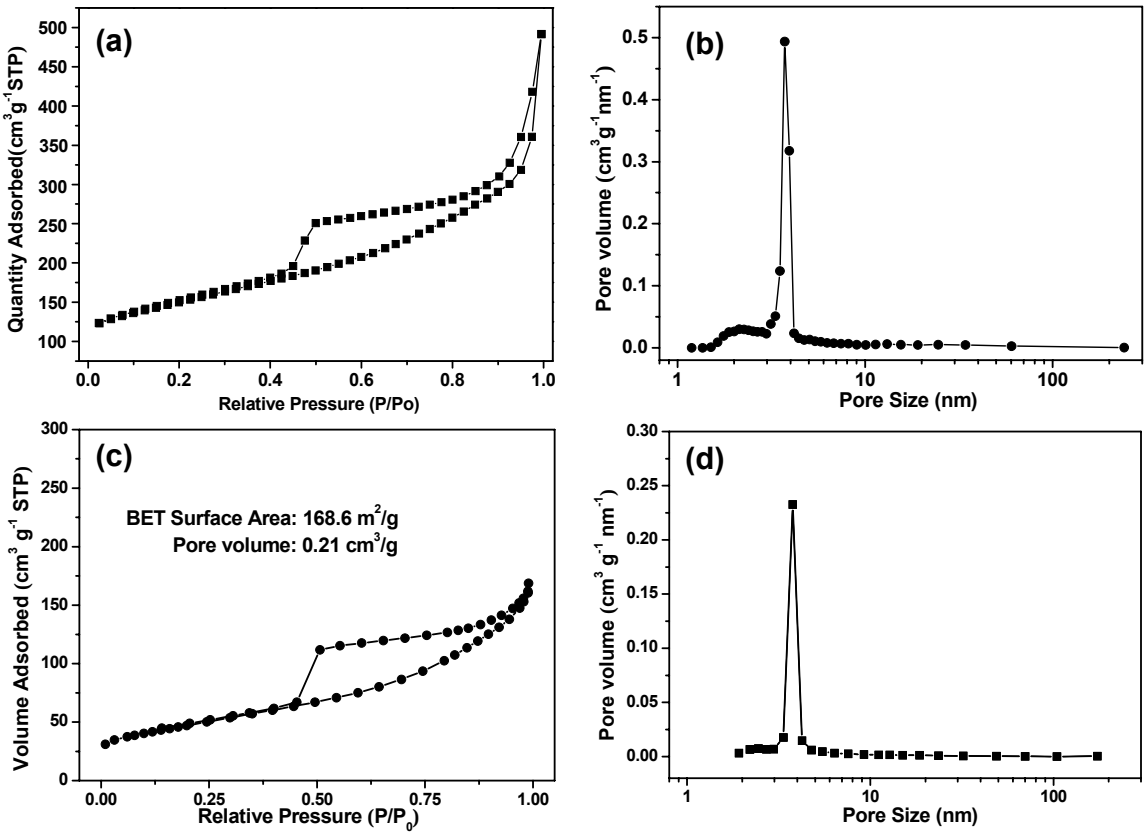

Figure S4. a) Nitrogen adsorption–desorption isotherms, and b) pore size distribution curve of 2D Fe_3O_4@C@PGC nanosheets. c) Nitrogen adsorption–desorption isotherms, and d) pore size distribution curve of 3D Fe_3O_4/C composite.

Table S1. Detailed information of battery performance of 2D Fe_3O_4@C@PGC and 3D Fe_3O_4/C composite electrode corresponding to Figure 4d.

Step number	Number of cycle	Charging rate (1C = 1 A/g)	Average reversible capacity of 2D Fe_3O_4@C@PGC composite electrode	Average reversible capacity of 3D Fe_3O_4/C composite electrode
1	50	1 C	977 mAh/g	505 mAh/g
2	50	2 C	905 mAh/g	362 mAh/g
3	50	5 C	858 mAh/g	198 mAh/g
4	50	10 C	587 mAh/g	90 mAh/g
5	50	15 C	364 mAh/g	69 mAh/g
6	50	20 C	311 mAh/g	62 mAh/g
7	50	1 C	975 mAh/g	441 mAh/g

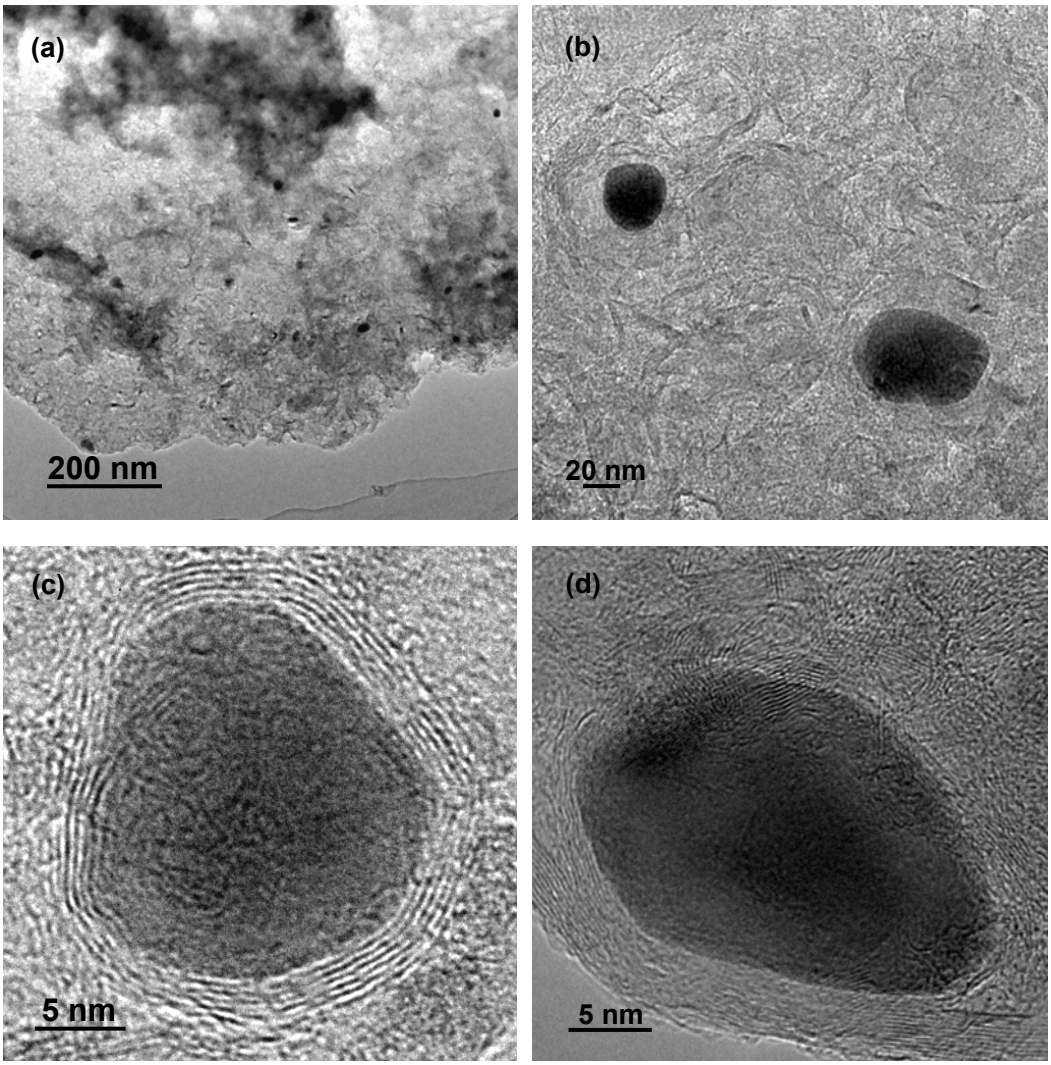

Figure S5. a)-b) TEM and c)-d) HRTEM images of Fe_3O_4@C@PGC composite electrode after 350 electrochemical cycles for rate performance test in Figure 4d.