Electronic Supplementary Information

Polyaniline coated Fe_3O_4 hollow nanospheres as anode materials for lithium ion batteries

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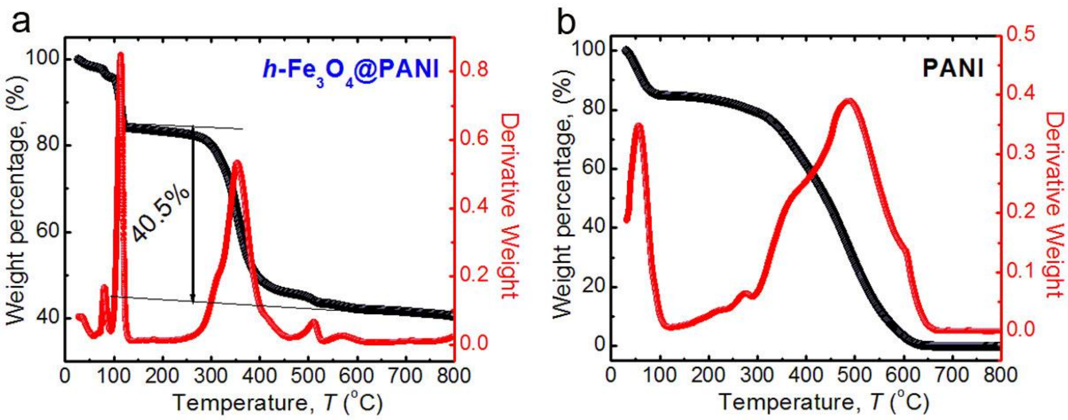

Fig. S1 Thermal gravimetric analysis (TGA, black lines) and derivative thermogravimetric (DTG, red lines) plots of (a) *h*-Fe_3O_4@PANI composites and (b) the pure PANI measured by using TG 2050 thermogravimetric analyzer under an air atmosphere at the temperature range of 25-800 °C with a heating rate of 10 °C min^{-1}.

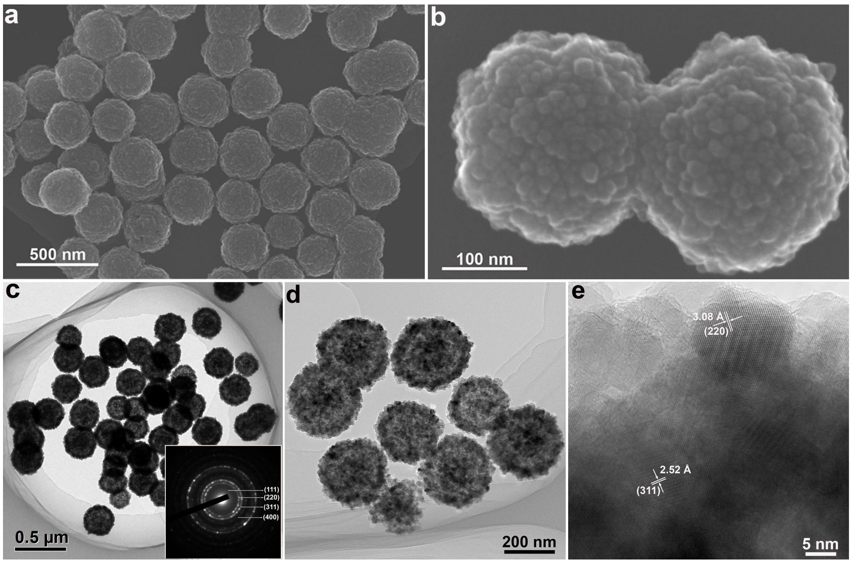

Fig. S2 Typical FESEM, TEM and HRTEM images of the *h*-Fe_3O_4 sample.

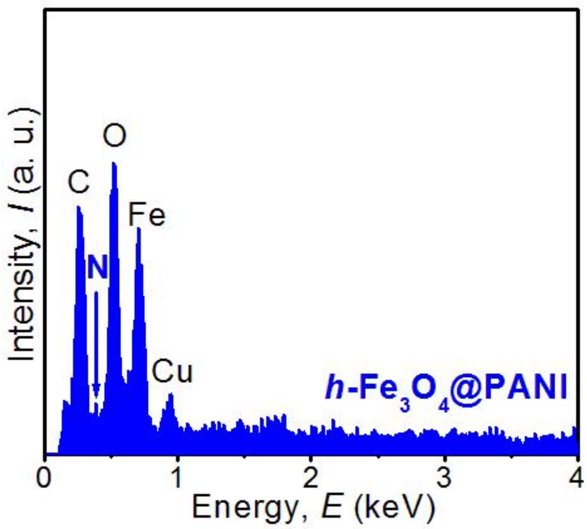

Fig. S3 EDX pattern of the *h*-Fe_3O_4@PANI sample.

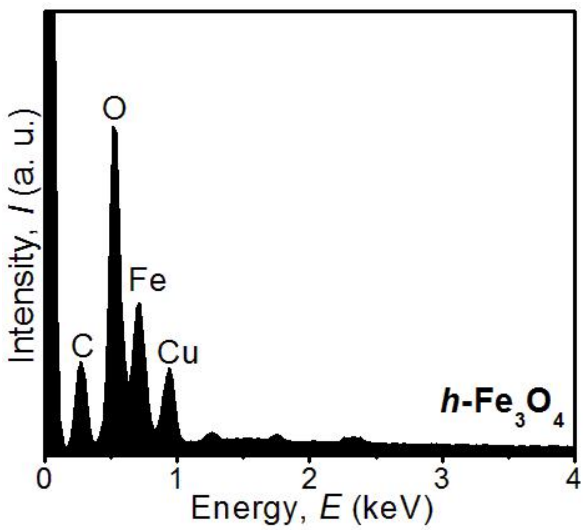

Fig. S4 EDX pattern of the *h*-Fe_3O_4 sample.

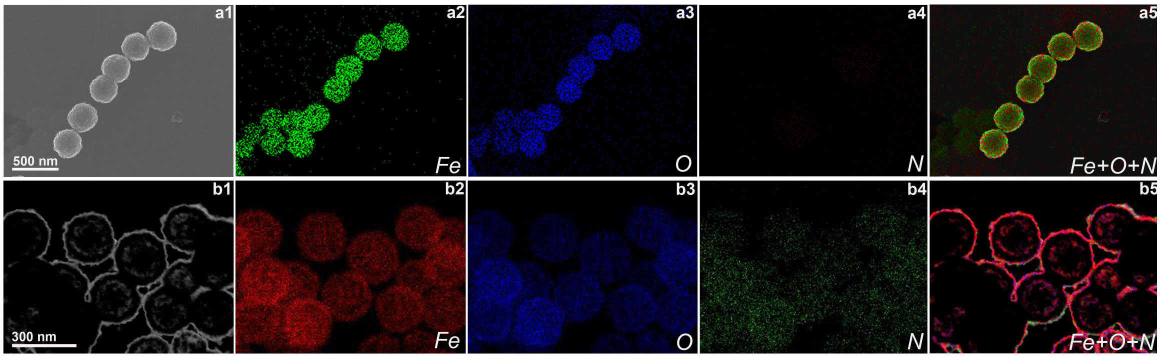

Fig. S5 The elemental maps of Fe, O and N for (a) *h*-Fe_3O_4 and (b) *h*-Fe_3O_4@PANI samples.

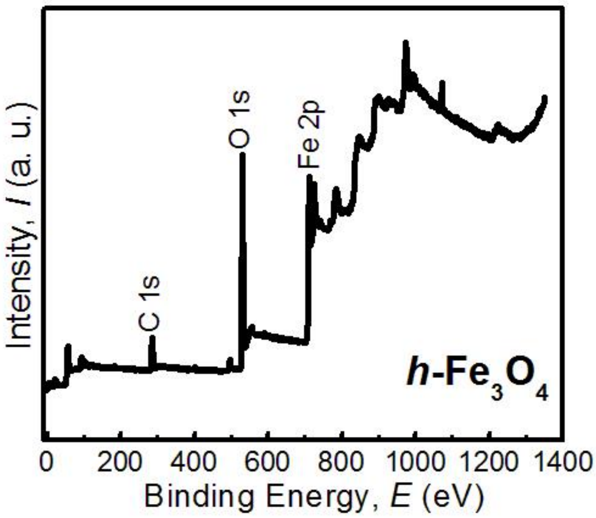

Fig. S6 XPS survey spectrum of the *h*-Fe_3O_4 sample.

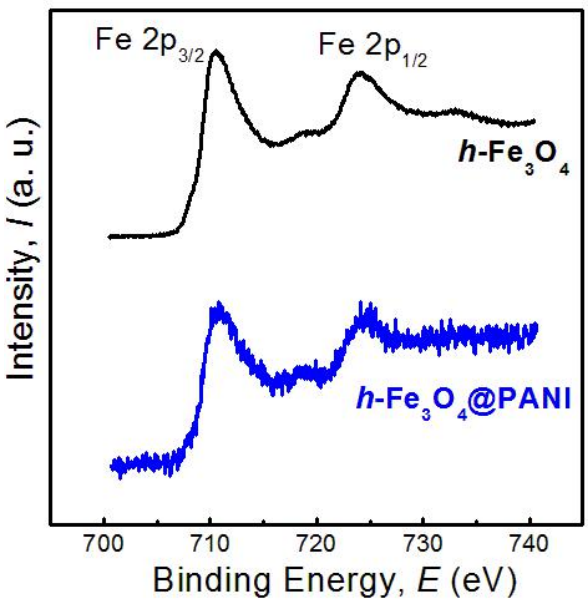

Fig. S7 (a) High-resolution XPS spectra of the Fe 2p region for the *h*-Fe_3O_4 (black) and *h*-Fe_3O_4@PANI (blue) samples.

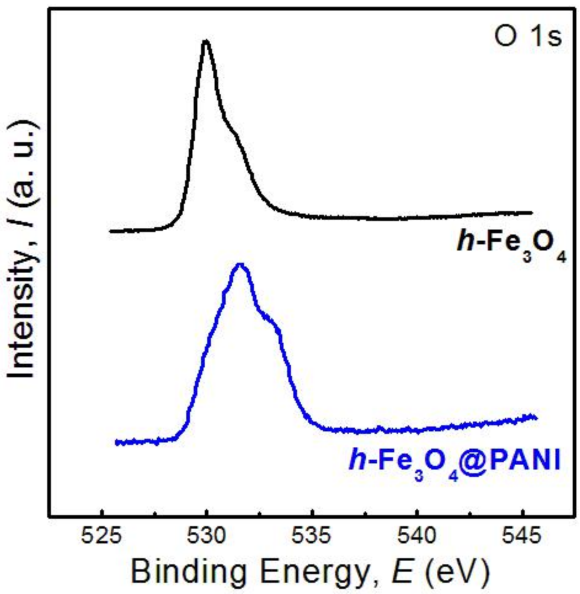

Fig. S8 High-resolution XPS spectra of the O 1s region for the *h*-Fe_3O_4 (black) and *h*-Fe_3O_4@PANI (blue) samples.

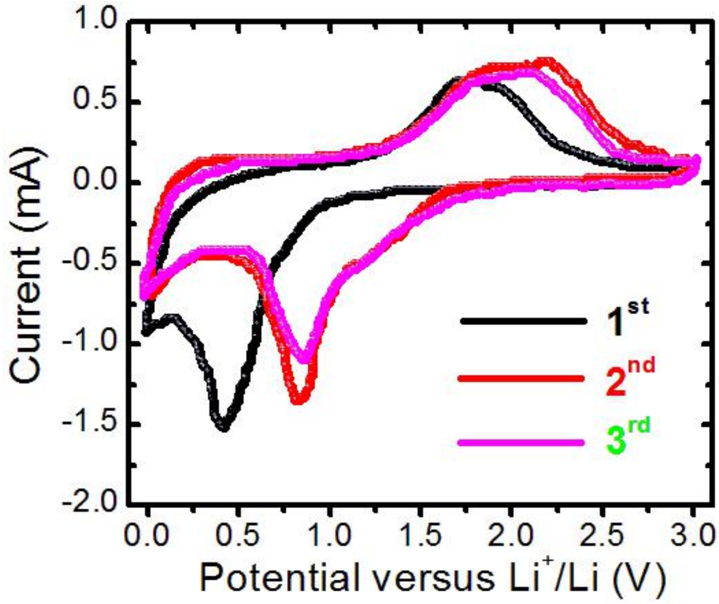

Fig. S9 CVs of *h*-Fe_3O_4@PANI sample at a scan rate of 0.5 mVs^{-1} between 0.05 and 3 V.

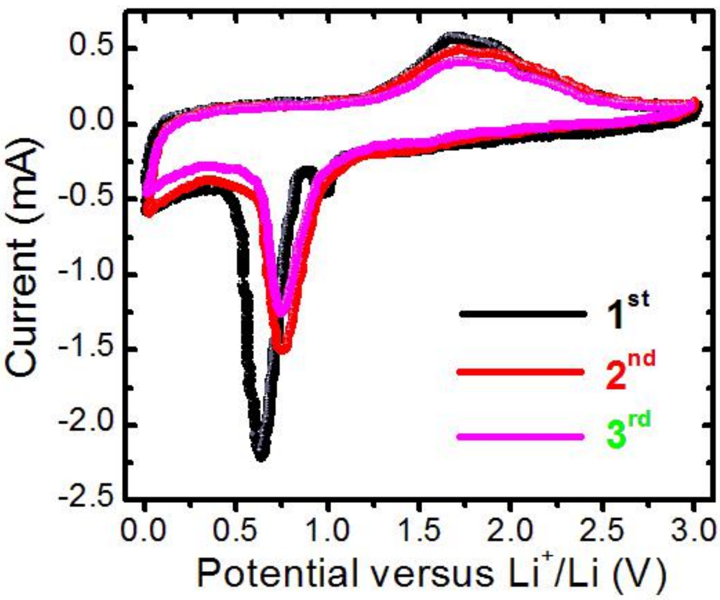

Fig. S10 CVs of *h*-Fe_3O_4 sample at a scan rate of 0.5 mVs $^{-1}$ between 0.05 and 3 V.

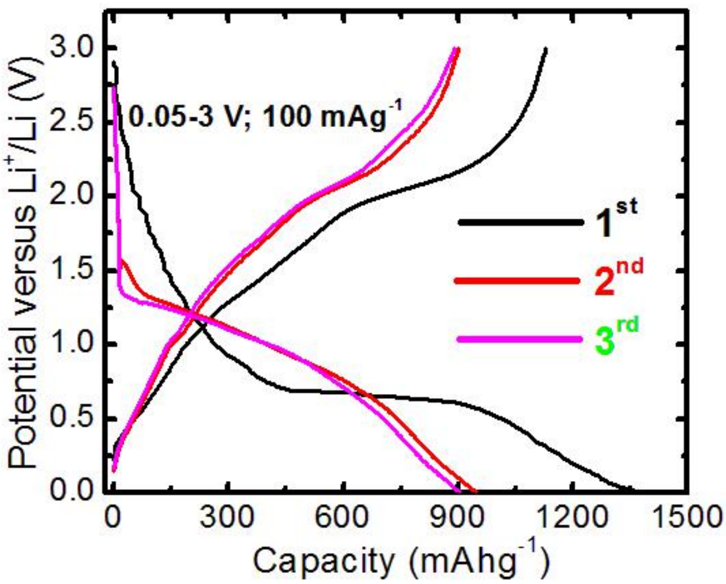

Fig. S11 Galvanostatic charge/discharge curves of *h*-Fe_3O_4 for the first three cycles between 0.05 V and 3.00 V (vs. Li^+/Li) at a current density of 100 mAg^{-1}.

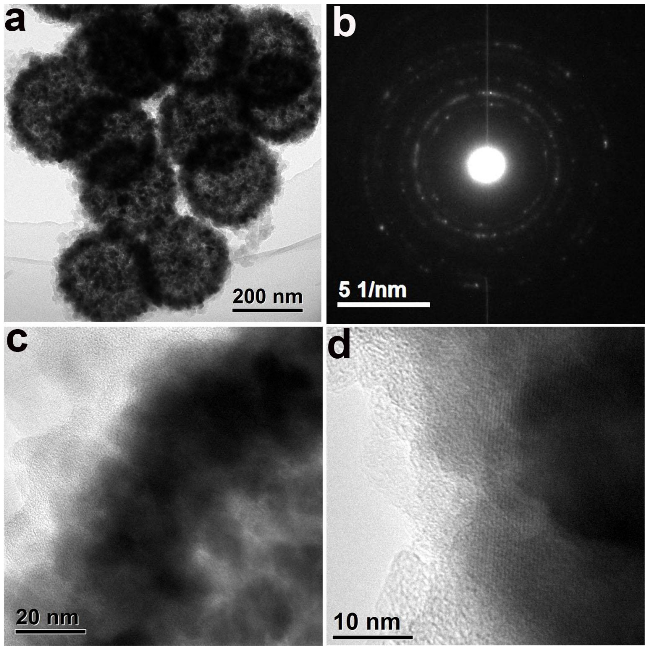

Fig. S12 (a) TEM image, (b) SAED pattern and (c, d) HRTEM images of the *h*-Fe_3O_4@PANI electrode after cycling performance testing (50 cycles, current rate 0.1 C, 0.01-3 V versus Li/Li^+).

Table S1 Performance comparison of some LIB anode materials based on typical Fe_3O_4 structures (1 C = 1000 mAg^{-1})

	Voltage Window /V (vs. Li^+/Li)	Reversible Capacity(cycles) /mAh g^{-1}	Rate Capability /mAh g^{-1}	Ref
Fe_3O_4 hollow microspheres	0.05 – 3.0	580@0.2 C (100)	40 @5C	1
Hollow ball-in-ball $Co_xFe_{3-x}O_4$	0.005 – 3.0	650.2@1C (100)	201.6 @10C	2
Fe_3O_4 microspheres	0.01 – 3.0	450 @0.2C (110)	——	3
Fe_3O_4 nanocubes	0.001 – 3.0	221.9@0.2 C (60)	51 @5C	4
Fe_3O_4/Fe nanocomposites	0.05 – 3.0	390@0.2C (50)	260 @2C	5
porous Fe_3O_4 thin films	0.01 – 3.0	366@0.1C (100)	120 @5C	6
mesoporous Fe_3O_4 nanorods	0.05 – 3.0	825.4 @0.1C (50)	715.7 @1C	7
TiO_2 and Fe_3O_4 with graphene	0.01 – 3.0	703@0.5 C (200)	169 @8C	8
Fe_3O_4@C/CNT nanostructures	0.01 – 3.0	693@0.3 C (200)	282 @1.2C	9
Fe_3O_4/graphene sheet composites	0.01– 3.0	1134 @0.1C	502 @5C	10
Fe_3O_4 on aligned carbon nanotubes	0.1 – 3.0	1670 @0.1C	340 @9C	11
Fe_3O_4/Fe/Carbon composite	0.002 – 3.0	685 @0.05C	500 @0.5C	12
Fe_3O_4@polypyrrole nanocages	0.01– 3.0	950 @0.2C	490 @5C	13
Porous Fe_3O_4/C microbelts	0.01 – 3.5	710@0.1 C (50)	184 @3C	14
Carbon-encapsulated Fe_3O_4 nanoparticles	0.005 – 3.0	998@1 C (100)	576 @10C	15
Yolk-shelled Fe_3O_4@carbon	0.01 – 3.0	1012@0.1 C (70)	900 @5C	16
Fe_3O_4-carbon nanocomposites	0.005 – 3.0	1409@0.2C (100)	414 @5C	17
Fe_3O_4 nanoparticles in porous carbon	0.01– 3.0	702@0.35C (50)	——	18
Nitrogen-doped carbon encapsulated Fe_3O_4	0.005 – 3.0	848@0.1C (50)	360 @2C	19
Fe_3O_4/C composite beads	0.05 – 3.0	698.8@0.1C (50)	573.1 @0.5C	20
Fe_3O_4@carbon nanorods	0.01 – 3.0	808.2@1C (100)	——	21
Hierarchical hollow Fe_3O_4 microspheres	0.01– 3.0	851.9@1C (50)	654.5@5C	22
Hollow Fe_3O_4/C spheres	0.01– 3.0	984@0.2C (70)	460 @5C	23
Fe_3O_4@C core–shell nanorings	0.01– 3.0	923@0.2C (160)	632 @1C	24
C/ Fe_3O_4/C core-shell nanotubes	0.01– 3.0	700@0.1C (120)	——	25

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