Supporting information

Self-crosslink assisted synthesis of 3D porous branch-like Fe_3O_4/C hybrids for high-performance lithium/sodium-ion batteries

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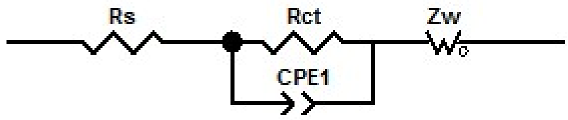

Fig. S1. The equivalent circuit used to simulate the EIS data.

Table S1 The lithium storage performance of Fe_3O_4/C compared with previous works

Fe_3O_4-based materials	Rate performance	Cycling performance	Ref.
Fe_3O_4/C	974 mAh g^{-1} at 0.1 A g^{-1} /570 mAh g^{-1} at 2 A g^{-1}	200 cycles at 0.1 A g^{-1} 98% retention	This work
Fe_3O_4-CNT	885 mAh g^{-1} at 0.09 A g^{-1} /529 mAh g^{-1} at 1.8 A g^{-1}	100 cycles at 0.1 A g^{-1} 92% retention	1
3D Fe_3O_4@GS/GF	802 mAh g^{-1} at 0.15 A g^{-1} /363 mAh g^{-1} at 4.8 A g^{-1}	150 cycles at 0.093 A g^{-1} >100% retention	2
G-Fe_3O_4-GNRs	~800 mAh g^{-1} at 0.1 A g^{-1} /~500 mAh g^{-1} at 1 A g^{-1}	300 cycles at 0.1 A g^{-1} 88.5% retention	3
Fe_3O_4@mC	580 mAh g^{-1} at 0.5 A g^{-1} /271 mAh g^{-1} at 10 A g^{-1}	500 cycles at 2 A g^{-1} >100% retention	4
R-Fe_3O_4@C	920 mAh g^{-1} at 0.1 A g^{-1} /432 mAh g^{-1} at 1 A g^{-1}	100 cycles at 0.2 A g^{-1} 871 mAh g^{-1}	5
GF@Fe_3O_4	780 mAh g^{-1} at 1 A g^{-1} /350 mAh g^{-1} at 10 A g^{-1}	500 cycles at 1 A g^{-1} >100% retention	6
Fe_3O_4@C@PGC	977 mAh g^{-1} at 1 A g^{-1} /311 mAh g^{-1} at 20 A g^{-1}	350 cycles at 10 A g^{-1} 96.5% retention	7
Porous GN@C/Fe_3O_4	732 mAh g^{-1} at 0.2 A g^{-1} /330 mAh g^{-1} at 5 A g^{-1}	100 cycles at 0.1 A g^{-1} 87% retention	8
Fe_3O_4/C NFs	982 mAh g^{-1} at 0.1 A g^{-1} /636 mAh g^{-1} at 1 A g^{-1}	300 cycles at 1 A g^{-1} ~100% retention	9
Fe_3O_4@HCNS	1029 mAh g^{-1} at 0.1 A g^{-1} /290 mAh g^{-1} at 10 A g^{-1}	200 cycles at 1 A g^{-1} >100% retention	10
G-Fe_3O_4@C	860 mAh g^{-1} at 0.1 A g^{-1} /460 mAh g^{-1} at 2 A g^{-1}	100 cycles at 0.1 A g^{-1} 90% retention	11
Fe_3O_4 hollow spheres	992 mAh g^{-1} at 1 A g^{-1} /457 mAh g^{-1} at 10 A g^{-1}	100 cycles at 0.5 A g^{-1} 94% retention	12
Carbon coated Fe_3O_4	835 mAh g^{-1} at 0.1 A g^{-1} /570 mAh g^{-1} at 1 A g^{-1}	60 cycles at 0.1 A g^{-1} ~100% retention	13
CNT@Fe_3O_4@C	~900 mAh g^{-1} at 0.2 A g^{-1} /~600 mAh g^{-1} at 5 A g^{-1}	80 cycles at 1 A g^{-1} 67% retention	14
Fe_3O_4@C-N	937 mAh g^{-1} at 0.1 A g^{-1} /490 mAh g^{-1} at 1 A g^{-1}	150 cycles at 0.5 A g^{-1} 102% retention	15
Hollow-Fe_3O_4@C/GNS	870 mAh g^{-1} at 0.1 A g^{-1} /285 mAh g^{-1} at 10 A g^{-1}	200 cycles at 10 A g^{-1} 93% retention	16

NCW@Fe_3O_4@NCS	1134 mAh g^{-1} at 0.05 A g^{-1} /426 mAh g^{-1} at 10 A g^{-1}	150 cycles at 0.1 A g^{-1} 134% retention	17
Fe_3O_4/GN	825 mAh g^{-1} at 0.1 A g^{-1} /491 mAh g^{-1} at 4 A g^{-1}	70 cycles at 0.1 A g^{-1} >100% retention	18
Yolk-shelled Fe_3O_4@C	1012 mAh g^{-1} at 0.1 A g^{-1} /370 mAh g^{-1} at 20 A g^{-1}	8000 cycles at 10 A g^{-1} 475 mAh g^{-1}	19
Fe_3O_4@PPy nanocages	1120 mAh g^{-1} at 0.1 A g^{-1} /490 mAh g^{-1} at 5 A g^{-1}	500 cycles at 2 A g^{-1} 652 mAh g^{-1}	20
Fe_3O_4/CNTs/rGO	970 mAh g^{-1} at 0.2 A g^{-1} /540 mAh g^{-1} at 10 A g^{-1}	450 cycles at 1 A g^{-1} >100% retention	21

Table S2 The sodium storage performance of Fe_3O_4/C compared with previous works

Fe_3O_4-based materials	Rate performance	Cycling performance	Ref.
Fe_3O_4/C	339 mAh g^{-1} at 0.05 A g^{-1} /195 mAh g^{-1} at 1 A g^{-1} /138 mAh g^{-1} at 5 A g^{-1}	200 cycles at 0.1 A g^{-1} 93.5% retention 277 mAh g^{-1}	This work
3D-0D graphene-Fe_3O_4 QDs	316 mAh g^{-1} at 0.1 A g^{-1} /62 mAh g^{-1} at 5 A g^{-1}	200 cycles at 0.05 A g^{-1} 71% retention	22
Porous carbon-encapsulated Fe_3O_4	510 mAh g^{-1} at 0.2 A g^{-1} /163 mAh g^{-1} at 5 A g^{-1}	100 cycles at 0.5 A g^{-1} 309 mAh g^{-1}	23
Fe_3O_4@CNT	453 mAh g^{-1} at 0.2 A g^{-1} /118 mAh g^{-1} at 3.2 A g^{-1}	300 cycles at 0.1 A g^{-1} 377 mAh g^{-1}	24
Fe_3O_4-QDs@CNs	362 mAh g^{-1} at 0.1 A g^{-1} /290 mAh g^{-1} at 2 A g^{-1}	1000 cycles at 1 A g^{-1} 70% retention	25
Fe_3O_4/C	328 mAh g^{-1} at 0.3 A g^{-1} /213 mAh g^{-1} at 1 A g^{-1}	60 cycles at 0.1 A g^{-1} 380 mAh g^{-1}	26
Fe_3O_4/graphene	~200 mAh g^{-1} at 0.2 A g^{-1} /120 mAh g^{-1} at 2 A g^{-1}	260 cycles at 0.1 A g^{-1} 213 mAh g^{-1}	27
RGO/Fe_3O_4	246 mAh g^{-1} at 0.02 A g^{-1} /42 mAh g^{-1} at 1 A g^{-1}	200 cycles at 0.04 A g^{-1} 208 mAh g^{-1}	28
C/Fe_3O_4 embedded on CNTs	~320 mAh g^{-1} at 0.05 A g^{-1} /196 mAh g^{-1} at 2.4 A g^{-1}	50 cycles at 0.05 A g^{-1} ~320 mAh g^{-1}	29
Fe_3O_4 nanoparticles	248 mAh g^{-1} at 0.083 A g^{-1} /60 mAh g^{-1} at 1.67 A g^{-1}	50 cycles at 0.083 A g^{-1} 248 mAh g^{-1}	30
Fe_3O_4 materials	250 mAh g^{-1} at 0.055 A g^{-1}	10 cycles at 0.055 A g^{-1} 250 mAh g^{-1}	31

Table S3 The fitted Kinetic parameters of Fe_3O_4/C electrodes in LIBs and NIBs.

	R_s (Ω)	R_{ct} (Ω)	C_{dl}	
			T	P
Fe_3O_4/C in LIBs	61.77	162.6	2.055e-5	0.6985
Fe_3O_4/C in NIBs	40.44	445.8	1.3092e-5	0.7893

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