Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplementary Information

A General Strategy for Metal Oxide Nanoparticles Embedded into Heterogeneous Carbon Nanosheets as High-Rate Lithium-Ion Battery Anodes

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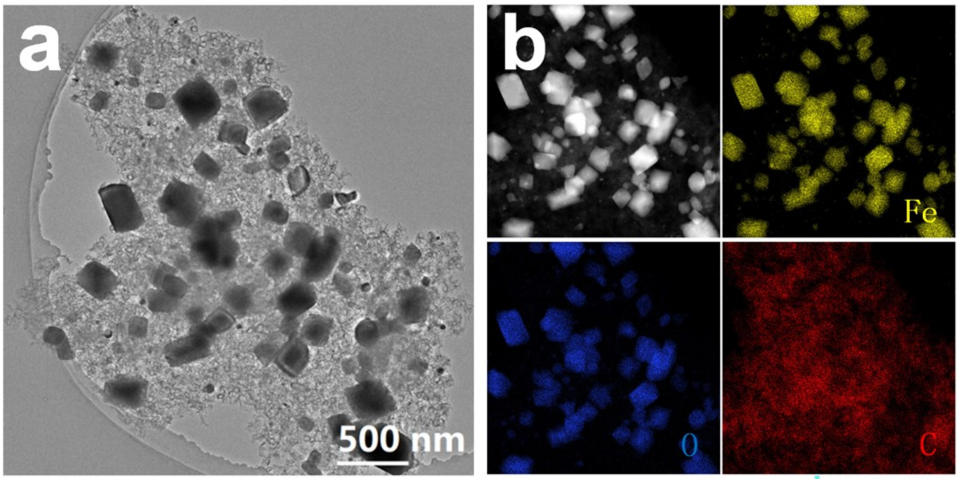

Figure S1. (a) TEM image of 2D-Fe_2O_3@HCCNSs. (b) EDX mapping images of 2D-Fe_2O_3@HCCNSs.

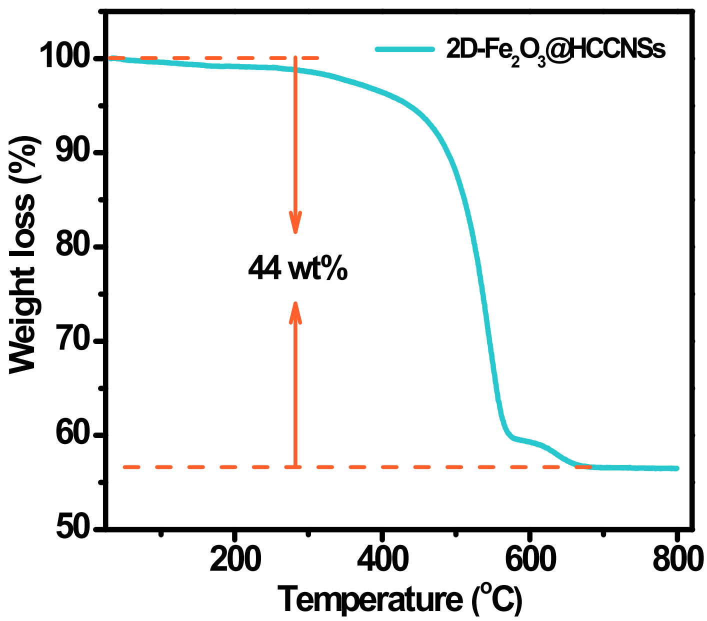

Figure S2. TG curve of 2D-Fe_2O_3@HCCNSs.

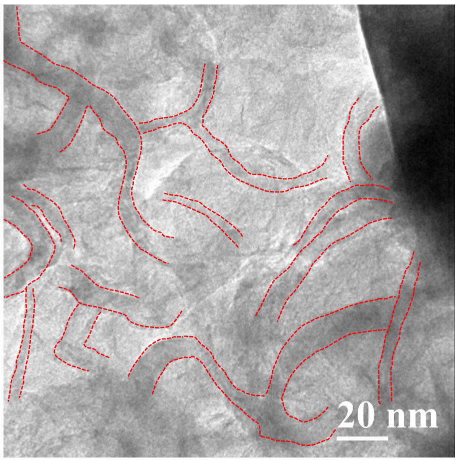

Figure S3. Magnified TEM image of 2D-Fe_2O_3@HCCNSs.

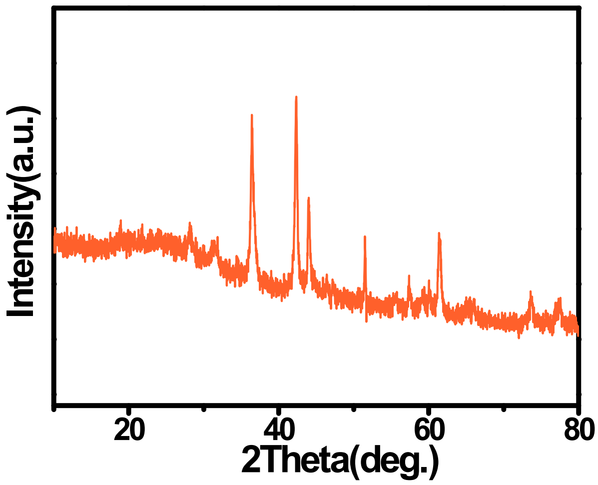

Figure S4. XRD pattern of 2D-CoO@HCCNSs.

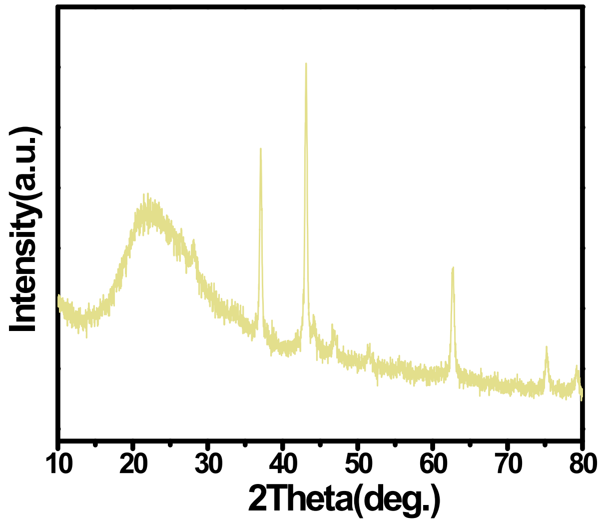

Figure S5. XRD pattern of 2D-NiO@HCCNSs.

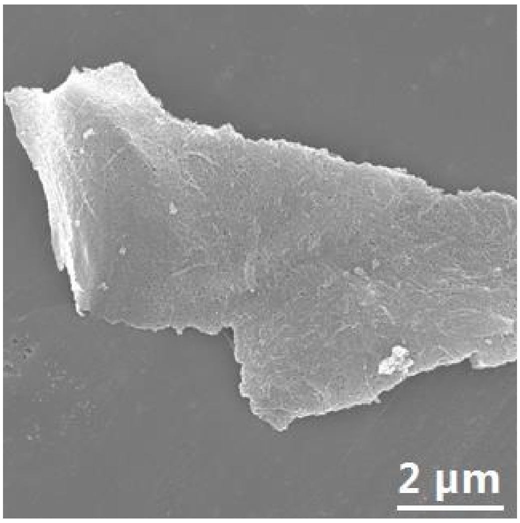

Figure S6. SEM image of 2D heterogeneous carbon nanosheet without Fe_2O_3.

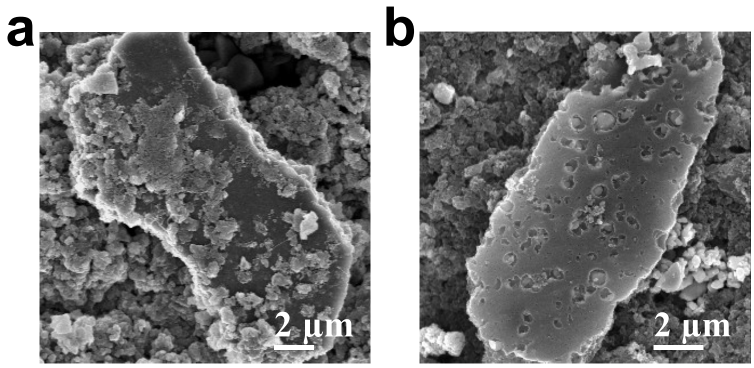

Figure S7. SEM images of (a) cycled electrode and (b) fresh electrode.

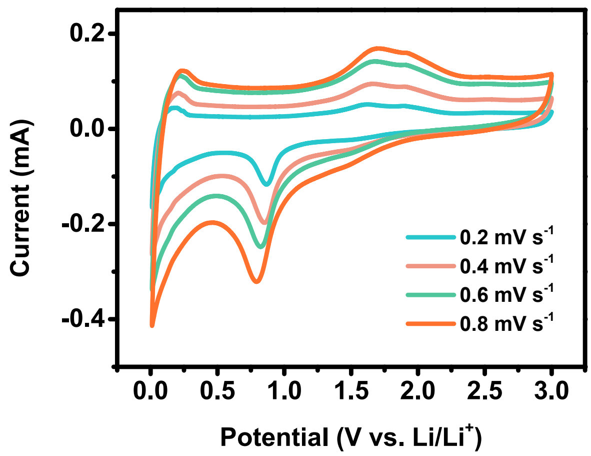

Figure S8. CV curves of 2D-Fe_2O_3@HCCNSs measured at the scan rates of 0.2, 0.4, 0.6 and 0.8 mV s^{-1}.

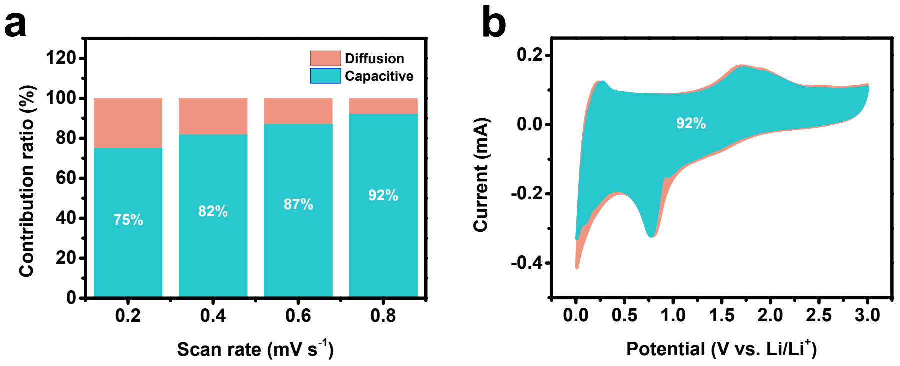

Figure S9. (a) Capacitive and diffusion-controlled contribution ratios of 2D-Fe_2O_3@HCCNSs anode at different scan rates. (b) Capacitive contribution ratio of 2D-Fe_2O_3@HCCNSs anode at 0.8 mV s^{-1}.

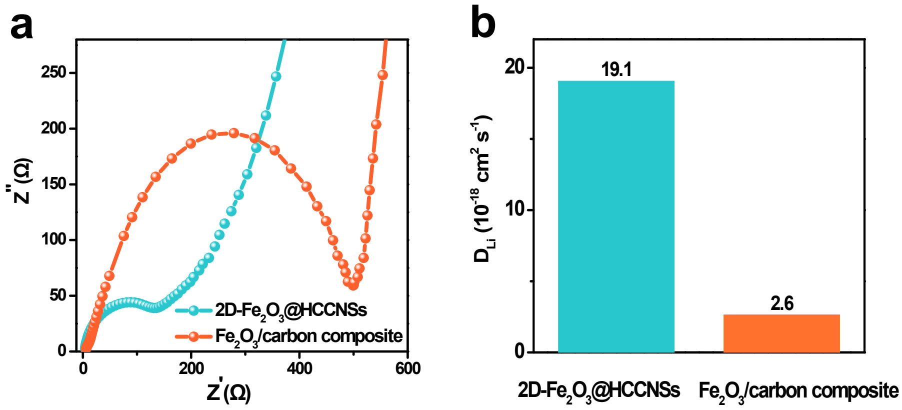

Figure S10. (a) EIS plots and (b) ion diffusion coefficients of 2D-Fe_2O_3@HCCNSs and Fe_2O_3/carbon composite.

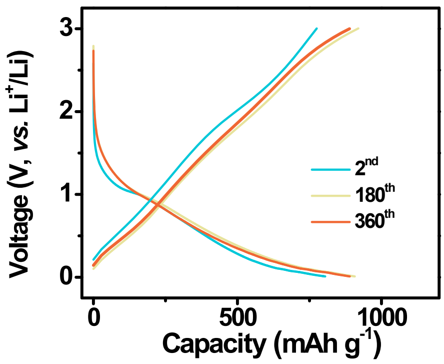

Figure S11. Typical charge/discharge profiles of 2D-Fe_2O_3@HCCNSs for different cycles.

Table S1. Comparisons of rate performances of 2D carbon-based anodes for LIBs.

Anodes	Current density ($A\ g^{-1}$)	Charge capacity ($mAh\ g^{-1}$)	Average attenuation capacity ($mAh\ g^{-1}\ A^{-1}$)	Ref.
$FeSe_2$@rGO	0.1/5	813/78	150	1
2D Co-Cu_2S@C	0.2/5	950/209	154.4	2
$NiSe_2$ nanosheets/CFC	0.1/2	1233/682	290.0	3
G@SnO_2@C	0.2/5	800/260	112.5	4
2D Ga_2O_3/C	0.2/10	1100/378	73.8	5
G@Fe_3O_4/NC	0.05/1	920/550	389.5	6
SnO_2@C NSs	0.1/3	993.8/621.7	128.3	7
C@SnO_2-rGO-SnO_2	0.2/10	1055/315	75.5	8
MnO/C@rGO	0.1/1	1334/933.1	445.4	9
0D-2D SnO_2 QDs/MXene	0.05/3	887.4/364	177.4	10
SnO_2@C HNSs	0.1/3	756.4/476.8	96.4	11
Cr_2O_3-CC	0.1/2	1210/414.2	418.8	12
S-Mn_3O_4-QDs/rGO	0.2/4	944/585	94.5	13
NRC/Si	0.1/5	2218/572	335.9	14
2D-Fe_2O_3@HCCNSs	**0.1/10**	**1150/437**	**72.0**	**This work**

Table S2. Comparison of charge capacity and charge time between 2D-Fe_2O_3@HCCNSs anode and ever reported anodes in literatures.

Anodes	Current density (A g^{-1})	Charge capacity (mAh g^{-1})	Charge time (min)	Ref.
N-C film	20	326	0.98	15
Fe_3O_4/carbon	5	674	8.09	16
Fe_3O_4/CuO	12.3	204	1.00	17
Graphene balls	7	241	2.07	18
Co@PCNS	8	510	3.82	19
TiO_2/SACNT	10.2	100	0.59	20
1D-PSiNWs	16	587	2.20	21
Al_2O_3@graphite	4	337	5.06	22
$CrNb_{11}O_{29}$	4.01	288	4.31	23
LTO-NF/TNT	1.7	160	5.73	24
TiO_2/MCFs	3.2	141	2.64	25
SPAN	5	450	5.40	26
MnO@NLEFC	20	309	0.93	27
MnO QD@CHNTs	50	393	0.47	28
RP/TiN/CNT	3	548.8	-	29
	8	436.6	-	
2D-Fe_2O_3@HCCNSs	**10**	**900**	**4.80**	**This work**
	50	**560**	**0.68**	

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