Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

A Highly Conductive and Robust Micrometre-sized SiO Anode Enabled by In Situ Grown CNT Network with a Safe Petroleum Ether Carbon Source

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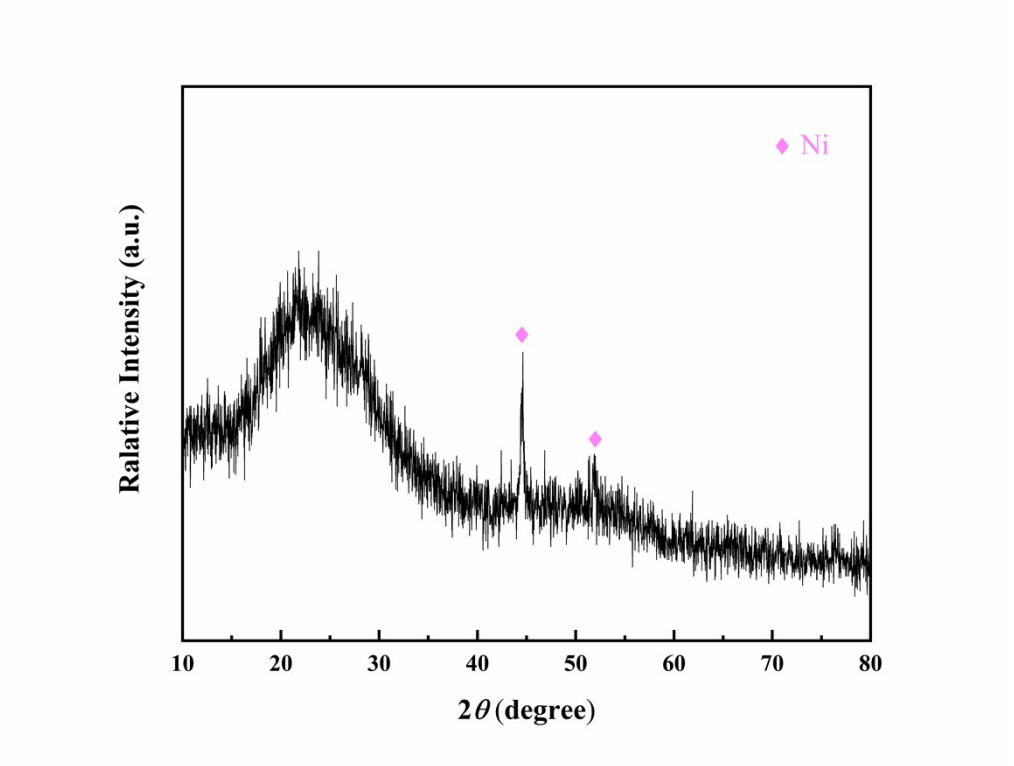

Figure S1. XRD spectrum of SiO@Ni treated at 600°C.

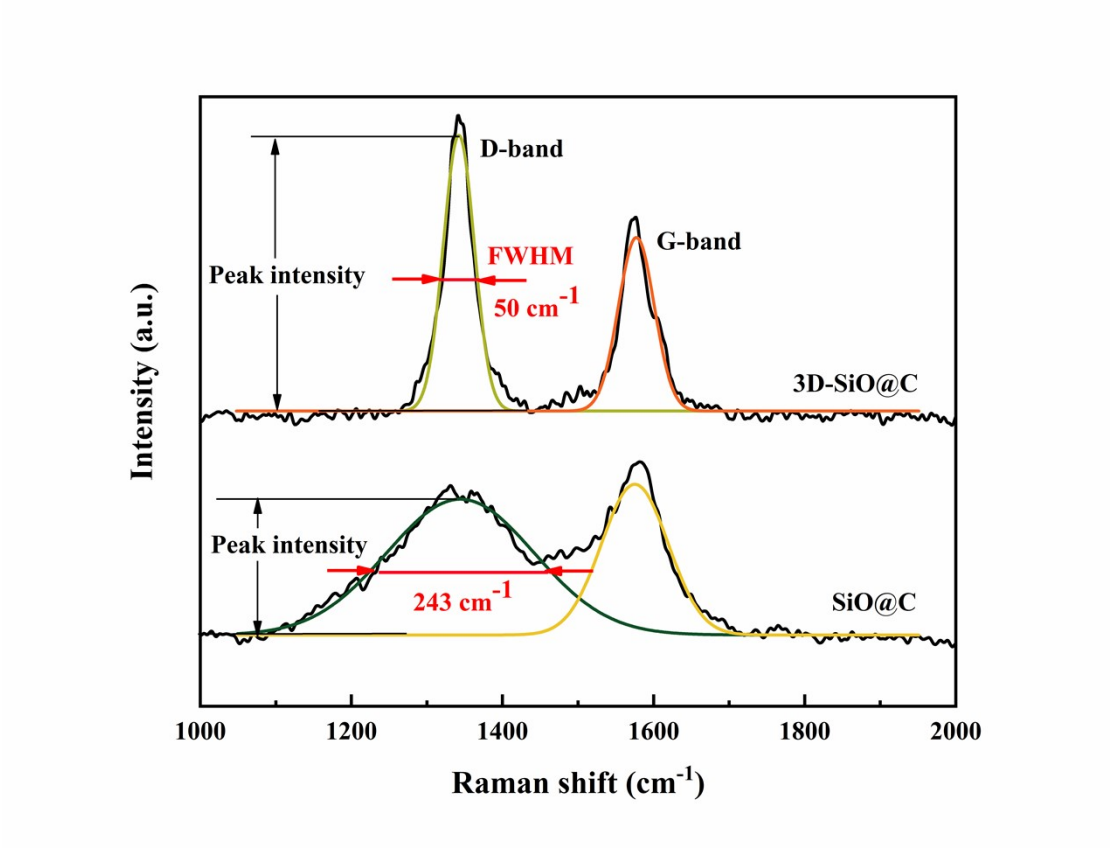

Figure S2. FWHM of D-band in Raman peaks for 3D-SiO@C and SiO@C.

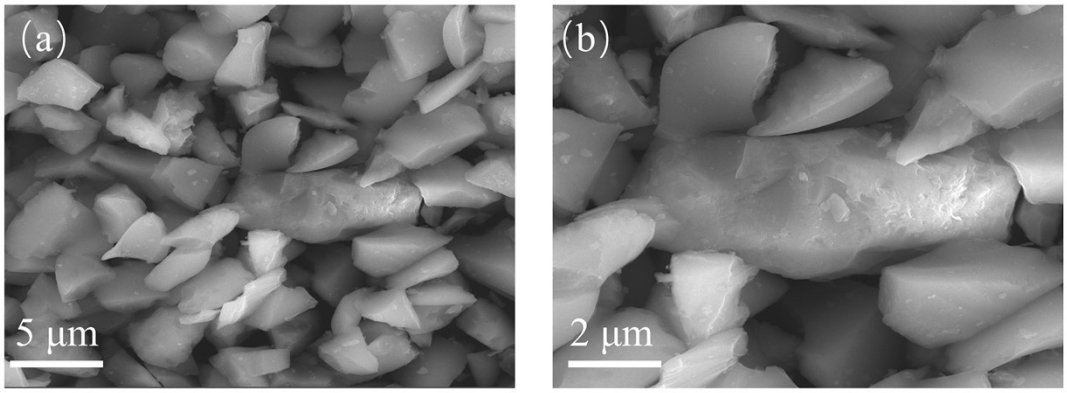

Figure S3. The SEM images of pristine SiO particle.

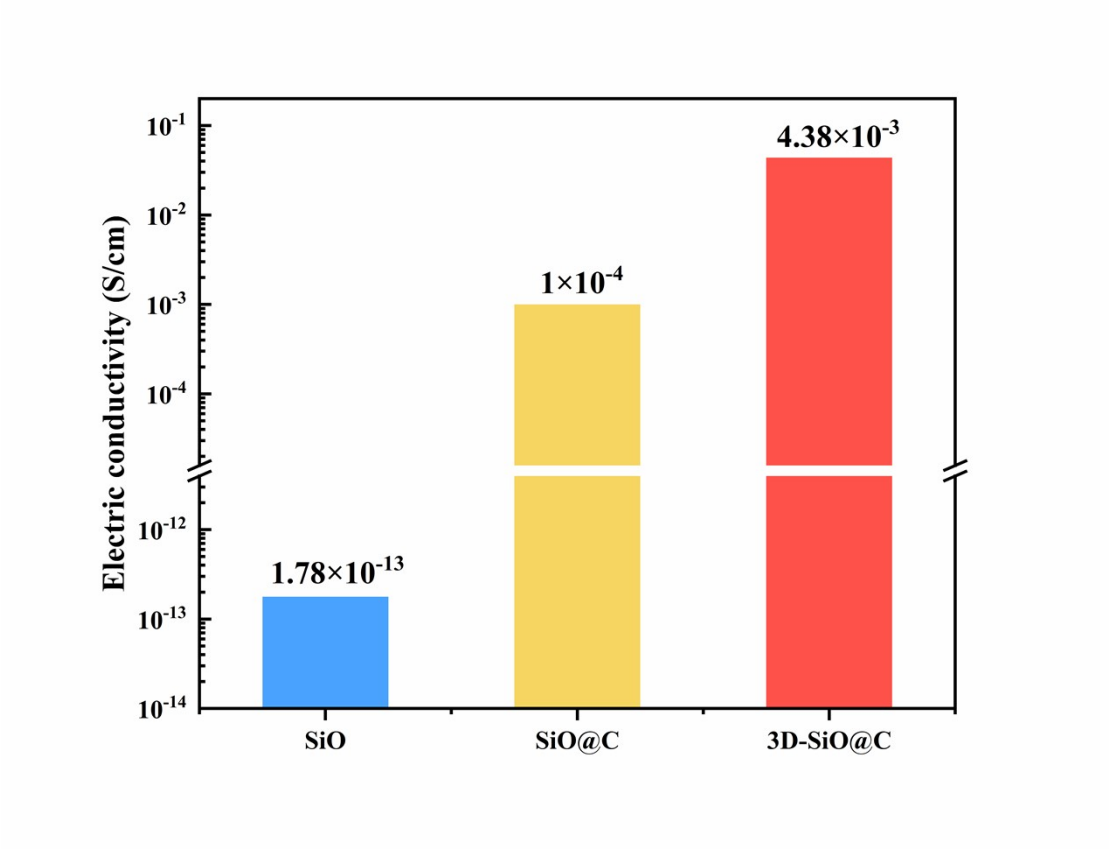

Figure S4. Electrical conductivity results of SiO, SiO@C and 3D-SiO@C.

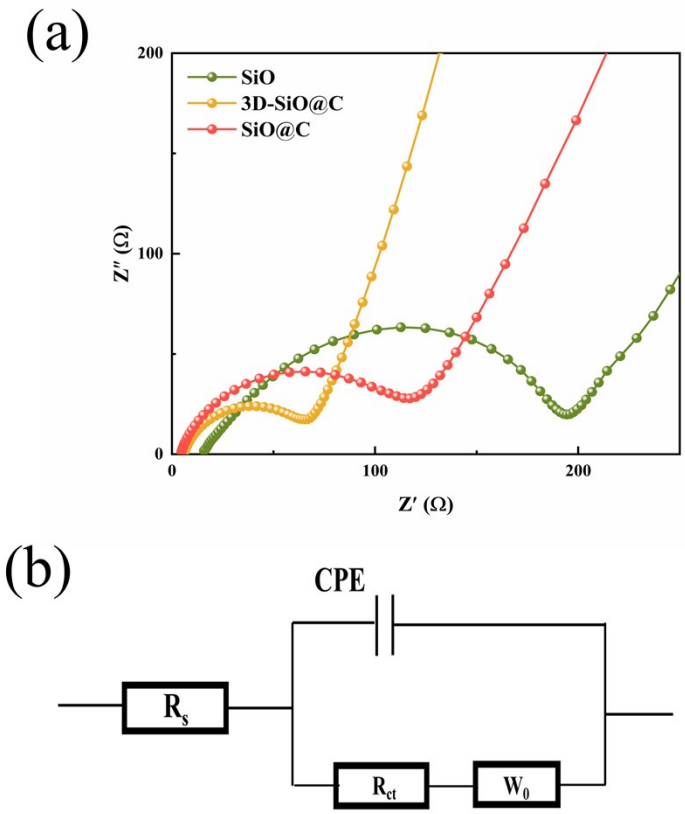

Figure S5. (a) EIS curves of SiO, 3D-SiO@C and SiO@C; (b) Equivalent circuit model.

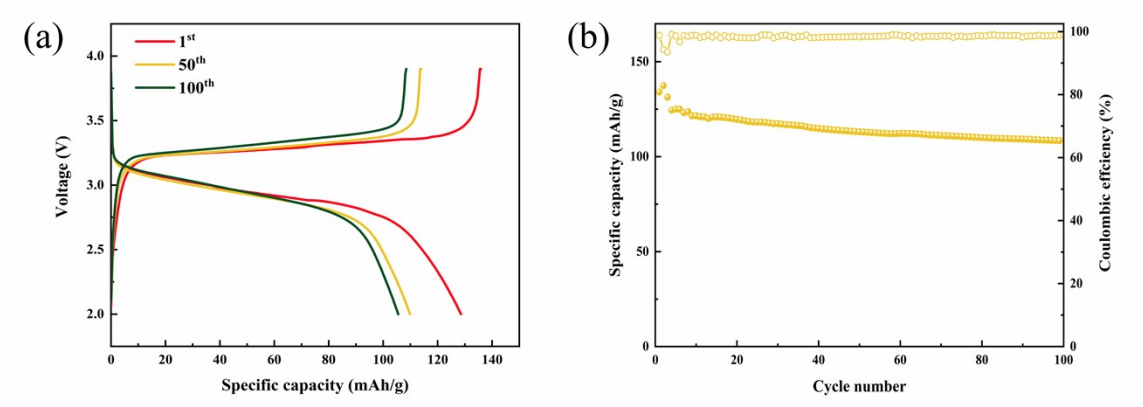

Figure S6. Cycle performance of LFP/3D-SiO@C full cell at 0.5 C.

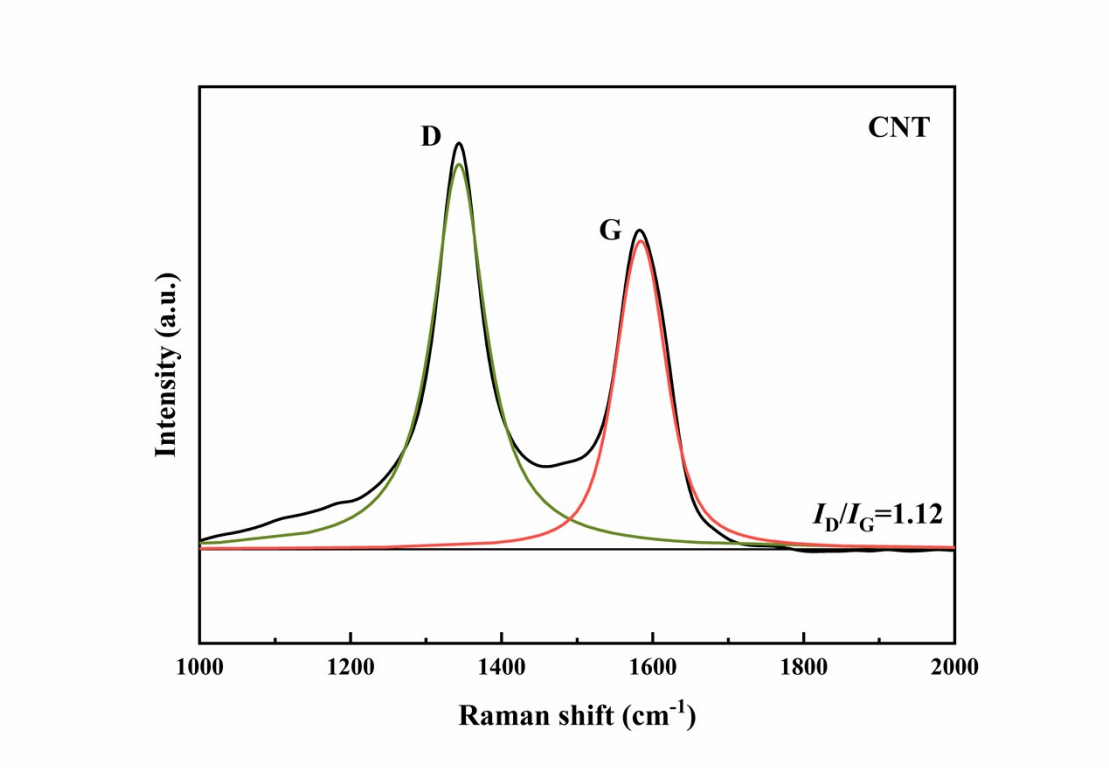

Figure S7. Raman spectrum fitting for pure CNTs.

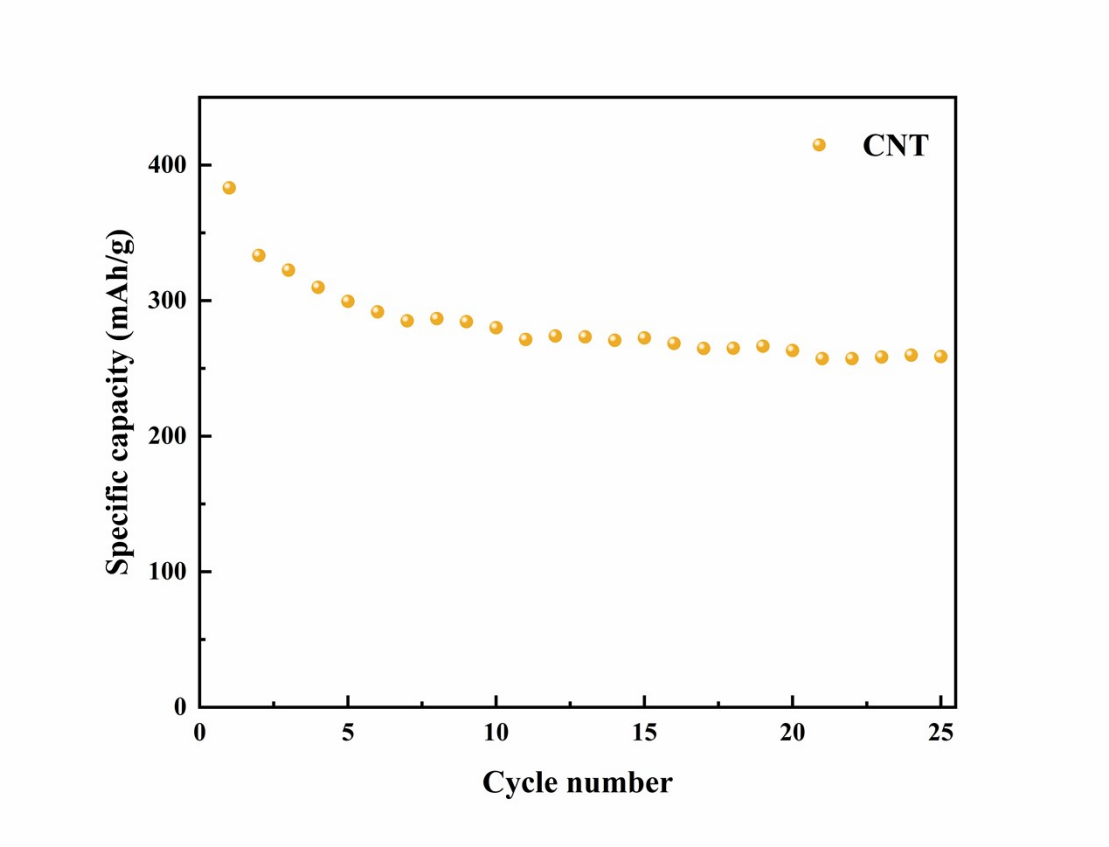

Figure S8. Cycling performance of the pure CNT anode.

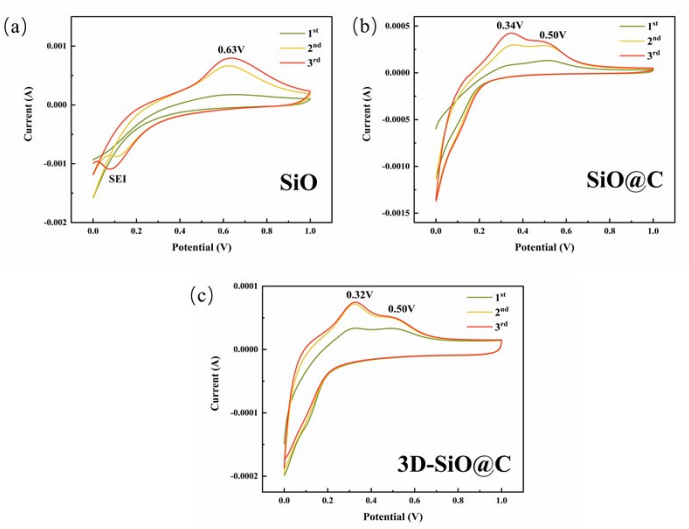

Figure S9. CV Curves of SiO, SiO@C and 3D-SiO@C.

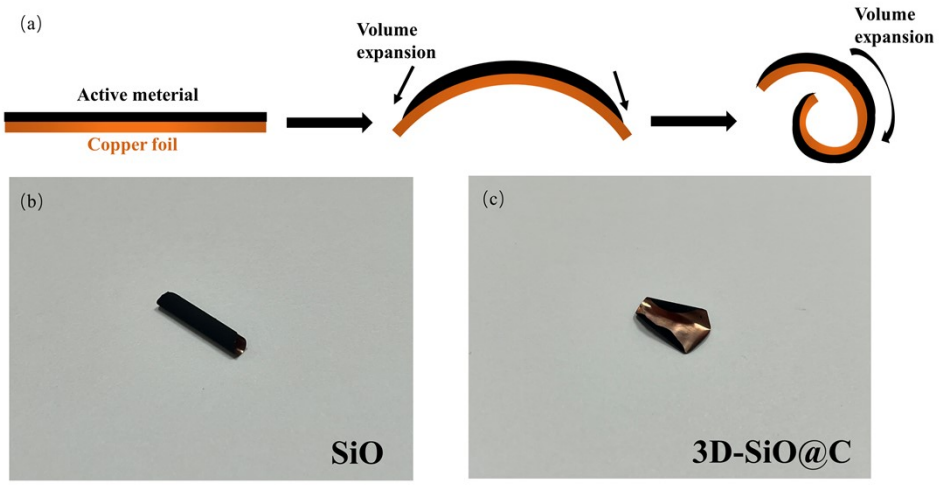

Figure S10. (a) Schematic diagram of electrod expansion; Photos of electrodes after cycle. (b) SiO@C; (c) 3D-SiO@C.

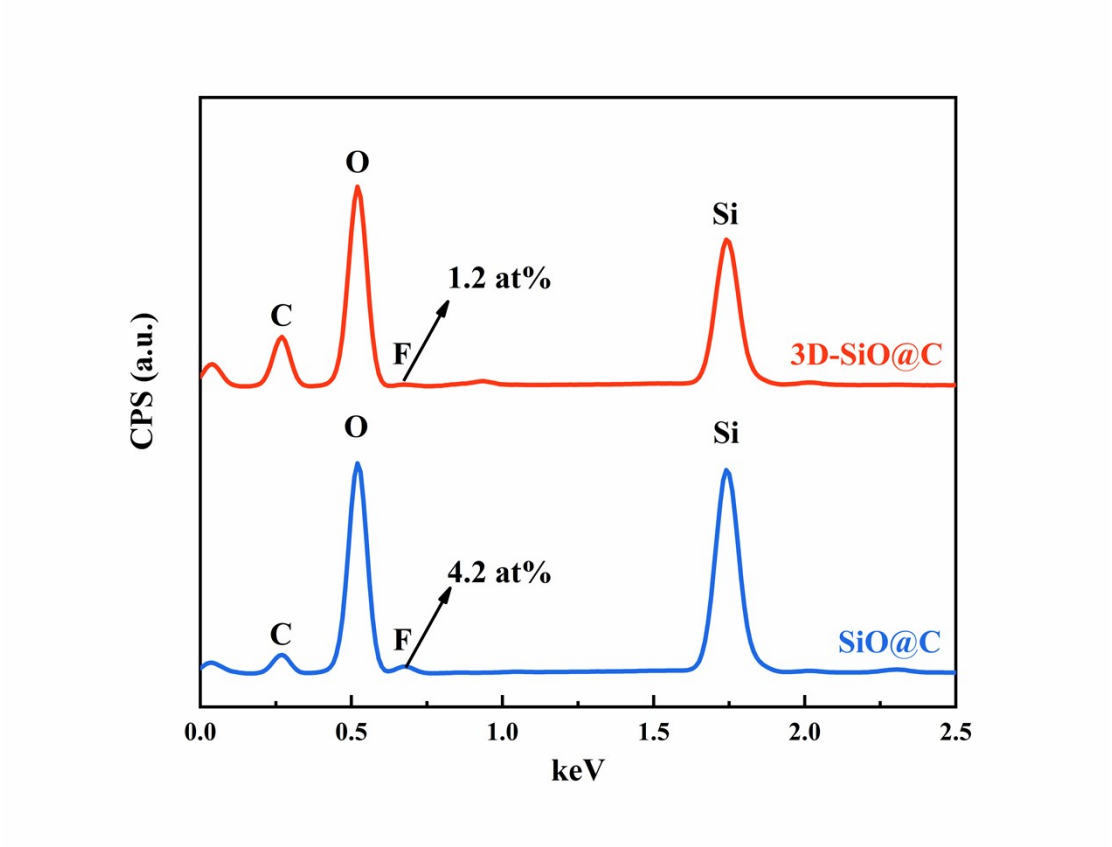

Figure S11. F contents of the surface of 3D-SiO@C and SiO@C electrodes after 100 cycles.

Table S1. Carbon contents of SiO@C and 3D-SiO@C powder from carbon-sulfur analyzer

Sample	Carbon content (wt %)
SiO@C	2.55
3D-SiO@C	14.8

Table S2. EIS fitting data of SiO, SiO@C and 3D-SiO@C electrodes before cycle

Sample	Rs (Ω)	Rct (Ω)
SiO	16.18	187.50
SiO@C	2.55	94.14
3D-SiO@C	5.86	62.14

Table S3. Capacity retention of three materials after 100 cycles

Sample	Remaining specific capacity (mAh/g)	Capacity retention (%)
3D-SiO@C	991.3	78
SiO@C	177.7	18.9
SiO	0	0

Table S4. Performance comparison for our work and other published literature recently

Material	Particle size	Reversible specific capacity	Current density [A/g]	Reference
Carbon-coated SiO/ZrO_2 composites	200-500 nm	721 mAh/g after 100 cycles	0.8	1
SiOx/C	300 nm	802 mAh/g after 300 cycles	0.2	2
P-SKW@C	341 nm	905 mAh/g after 200 cycles	0.5	3
HT-Si@ Cu-0.08	100-150 nm	837 mAh/g after 400 cycles	1	4
SiCA@C	~15-20 nm	760 mAh/g after 300 cycles	0.1	5
PCS/Si-2	~100 nm	585.6 mAh/g after 1000cycles	0.5	6
SiOx/C	4.78±1.23 nm	794 mAh/g after 150 cycles	0.1	7
Si@C-1.5h	25 nm	508 mAh/g after 500 cycles	0.5	8
Si/SiOx@G@C	~1 μm	780 mAh/g after 100 cycles	0.1	9
Si@DCSS	400 nm	525 mAh/g after 300 cycles	1	10
SiMPs@GO/ssDNA	Few micrometers	808 mAh/g after 450 cycles	0.84	11
Si2SHXF	~500 nm	622 mAh/g after 400 cycles	0.1	12
Si@VG	80-100 nm	444.9 mAh/g after 200 cycles	0.5	13
Fe-N-C/SiOx/C-3	200 nm	832.6 mAh/g after 250 cycles	0.1	14
SiCNTs-30	15.2 nm	980 mAh/g after 100 cycles	0.25	15
CNT/S/Silicon oxide	Few nanometers	368 mAh/g after 250 cycles	1	16
PSi@C	~0.85 μm	652 mAh/g after 300 cycles	0.5	17
Si/C-LPR	~70 nm	605.43 mAh/g after 100 cycles	0.5	18
Si@SiOx/Ag/CN	200 nm	759 mAh/g after 300 cycles	0.5	19
3D-SiO@C	5 μm	991.3 mAh/g after 100 cycles 832.8 mAh/g after 300 cycles 687.7 mAh/g after 1000 cycles	0.5	This work

Table S5. The element contents in the XPS results of SiO@C and 3D-SiO@C anode after 100 cycles

Element	Content (at%)	
	SiO@C	3D-SiO@C
C 1s	35.76	38.99
F 1s	7.77	2.95
Li 1s	31.06	29.96
O 1s	24.12	27.53
P 2p	1.29	0.57

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