Supplementary Information (SI) for Journal of Materials Chemistry A.

Supporting Information

Sustainable synthesis of metal compound/carbon composites via coordination chemistry for high-performance lithium-ion batteries

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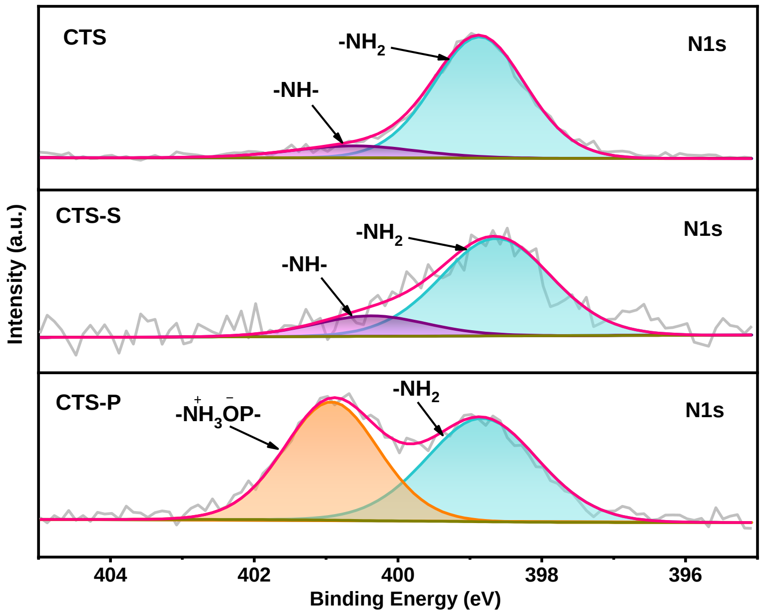

Fig. S1 N 1s spectra of CTS, CTS-S and CTS-P.

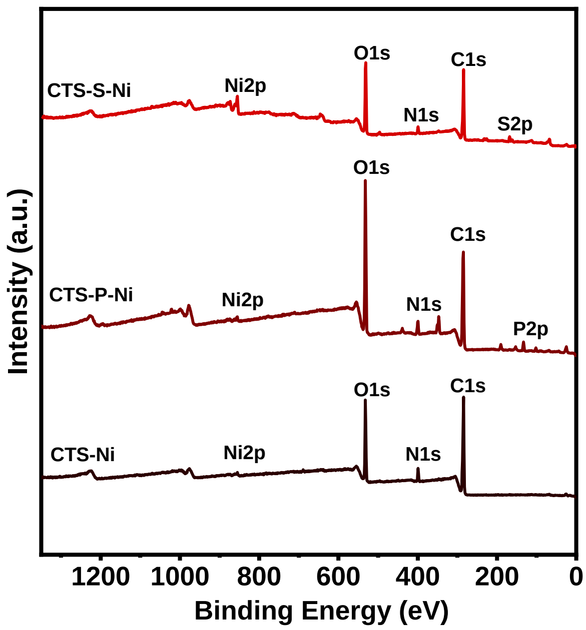

Fig. S2 XPS spectra of CTS-Ni, CTS-P-Ni and CTS-S-Ni.

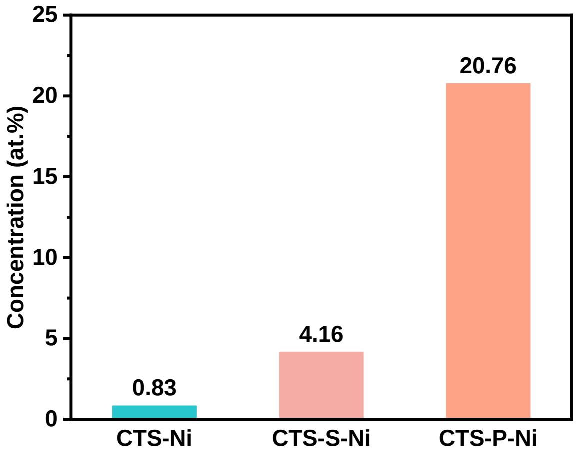

Fig. S3 Concentration of Ni in CTS-Ni, CTS-S-Ni and CTS-P-Ni.

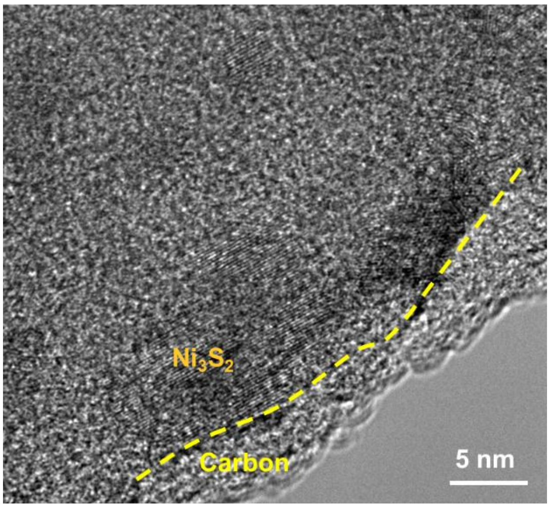

Fig. S4 HRTEM image of Ni_3S_2/C.

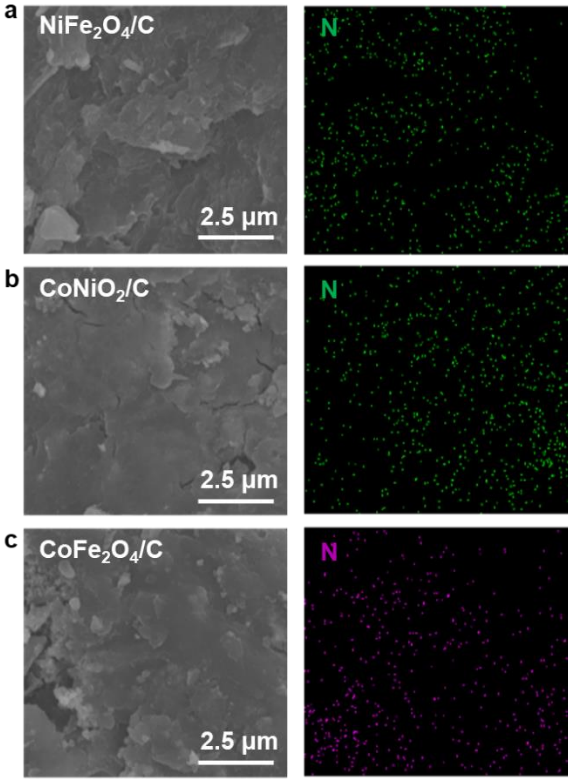

Fig. S5 SEM images and EDS images of $NiFe_2O_4$/C, $CoNiO_2$/C and $CoFe_2O_4$/C.

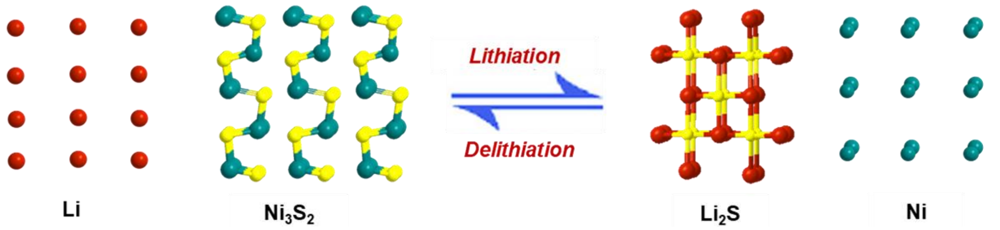

Fig. S6 Schematic illustration of lithium storage mechanism in Ni_3S_2/C anode.

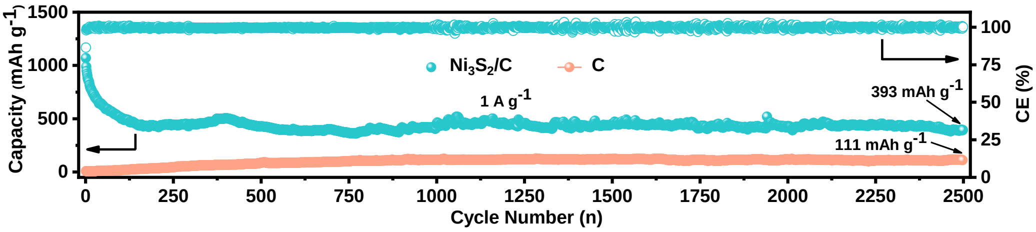

Fig. S7 Cycling performances of Ni_3S_2/C and C anodes at the current density of 1.0 A g^{-1}.

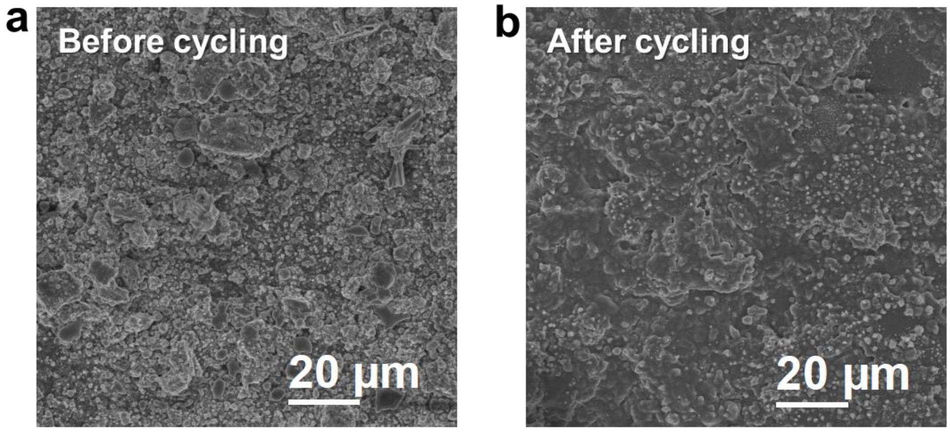

Fig. S8 SEM images of Ni_3S_2/C anode before and after cycling.

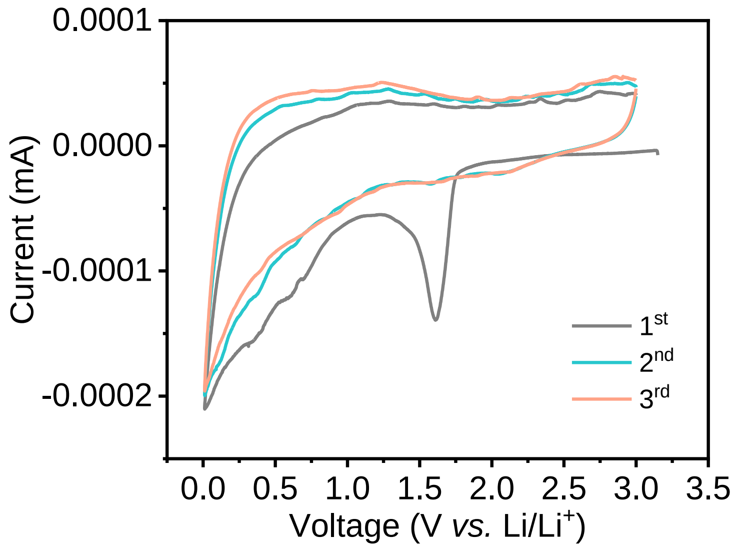

Fig. S9 CV curves of $Ni_{12}P_5$/C anodes at 0.2 mV s^{-1}.

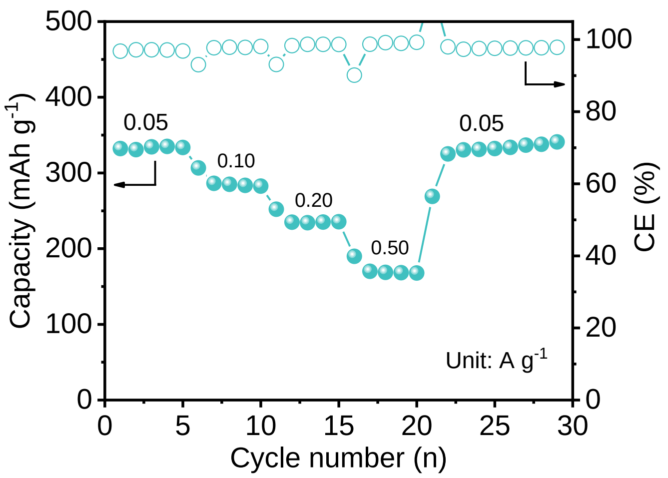

Fig. S10 Rate performance of $Ni_{12}P_5$/C anode.

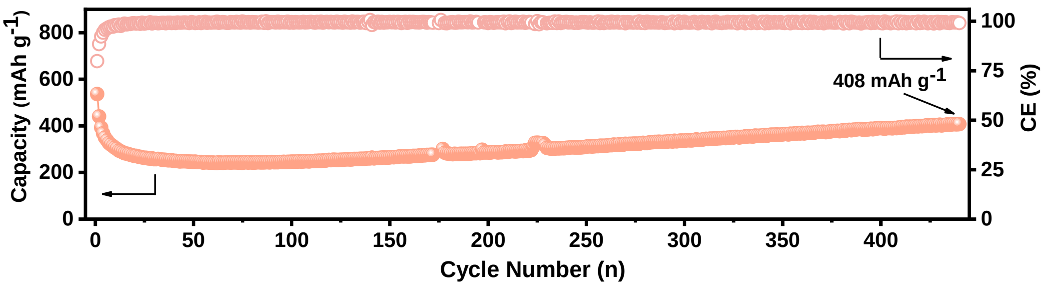

Fig. S11 Cycling performance of ZnS/C anode at the current density of 0.05 A g^{-1}.

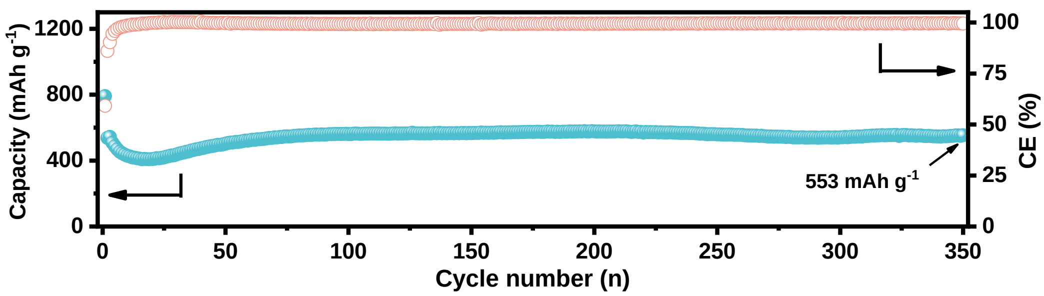

Fig. S12 Cycling performance of $NiFe_2O_4$/C anode at the current density of 0.10 A g^{-1}.

Table S1. Comparisons of the cycling performance of Ni_xS_y-based anodes for LIBs.

Anodes	Current density (A g^{-1})	Cycle number	Discharge capacity (mAh g^{-1})	Ref.
NiS–GNS	0.1	60	887	[1]
NiS@OLC	0.1	100	546	[2]
C⊃NiS-L	60	100	300	[3]
NiS/N-rGO	0.5	100	467	[4]
CSF-NiS/C	0.1	100	411.6	[5]
NiS/G	50	400	481	[6]
NiS_x/rGO-500	0.1	60	1026.0	[7]
NiS@SiO_2/graphene	0.1	100	750	[8]
HBC-NiS/C	0.2	100	652	[9]
NiS@NSC	0.1	200	715.9	[10]
Ni_3S_2/C	**0.05**	**250**	**1434**	**This work**

Table S2. Comparisons of the rate performance of Ni_xS_y-based anodes for LIBs.

Anodes	Rate capability/mAh g^{-1} (Numbers in parentheses denote current density in mA g^{-1})	Ref.
NiS@SiO_2/graphene	680 (20), 640 (30), 610 (50), 570 (80), 540 (1200), 500 (1600)	[8]
GeS_2@NiS@N-C	1166.2 (100), 1059.5 (200), 905.8 (500), 841.2 (800), 817.4 (1000), 724.8 (2000), 641.7 (5000), 593.2 (8000)	[11]
HBC-NiS/C	621 (200), 519 (500), 358 (1000), 170 (2000), 108 (3000)	[9]
NiS@NSC	601.2 (100), 530.4 (200), 491.5 (500), 479.1(1000),446.1(2000)	[10]
rGO@NiS	1025.7 (100), 933.6 (200), 835.8 (500), 752.1 (1000), 673.6 (2000), 538.1(5000)	[12]
NiS/C	827.8 (100), 715.0 (200), 551.8 (500), 455.6 (800), 384.5 (1000)	[13]
NiS⊂pCW⊂GN	625 (200),542 (500), 519 (800), 506 (1000), 476 (2000)，430(5000),374(10000)	[14]
NiS-GNS-CNT	935 (250),752 (500), 650 (1000), 565 (2000), 440 (4000)，330(8000)	[15]
Ni_3S_2/C	**1370 (50), 1117 (100), 1035 (200), 891 (500), 787 (750), 717 (1000), 565 (2000)**	**This work**

Table S3. Comparisons of the lithium-ion diffusion rate of MC/Cs anode in LIBs.

Anodes	D_{Li} ($cm^2\ s^{-1}$)	Methods	Ref.
NiS/C	1.3×10^{-10}	CV	[13]
FeP@C	1.04×10^{-14}	CV	[16]
Ni-FeP@C	2.53×10^{-14}	CV	
MoS_2	3.04×10^{-14}	EIS	[17]
Ni_3S_2-NCNFs	2.47×10^{-7}	CV	[18]
ZnSe/C	2.48×10^{-12}	EIS	[19]
CoSe@C	6.0×10^{-11}	EIS	[20]
SnSe/CoSe@C	3.6×10^{-9}	EIS	
rGO/$MnFe_2O_4$	1.62×10^{-6}	CV	[21]
MnO_2@PNC	1.0×10^{-8}	GITT	[22]
Co_2GeO_4	6.3×10^{-8}	CV	[23]
Co_xO_y@PC	6.6×10^{-17}	CV	[24]
O_V-MnO/Ni OCNs	8.43×10^{-12}	GITT	[25]
CFO@N-C	2.76×10^{-13}	EIS	[26]
O_v-MnO/Co NCPs	3.92×10^{-12}	EIS	[27]
Sb/Sb_2O_3-NC-450	9.5384×10^{-7}	CV	[28]
Co-MnO@C-CNTs	6.93×10^{-14}	GITT	[29]
MnO–CNTs@TiO_2–C	7.78×10^{-10}	EIS	[30]
$Mn_2Mo_3O_8$@C	8.20×10^{-17}	EIS	[31]
F-GeO_2@C	$2.8 \sim 5.7 \times 10^{-11}$ (discharge) $0.5 \sim 8.0 \times 10^{-11}$ (charge)	GITT	[32]
Ni_3S_2/C	**2.71×10^{-9} (discharge)** **2.27×10^{-9} (charge)**	**GITT**	**This work**

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