Electronic Supplementary Material (ESI) for Nanoscale Advances.

Supplementary data

Overcoming Copper-Induced Conversion Reactions in Nickel Disulphide Anodes for Sodium-Ion Batteries

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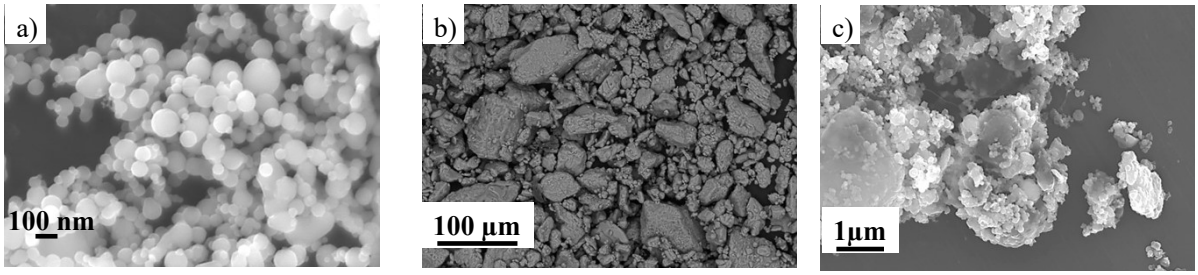


Figure S1. FESEM image of precursor: (a) nickel nanoparticle, (b) sulphur particle, and (c) nickel-sulphur mixture after ball milling.

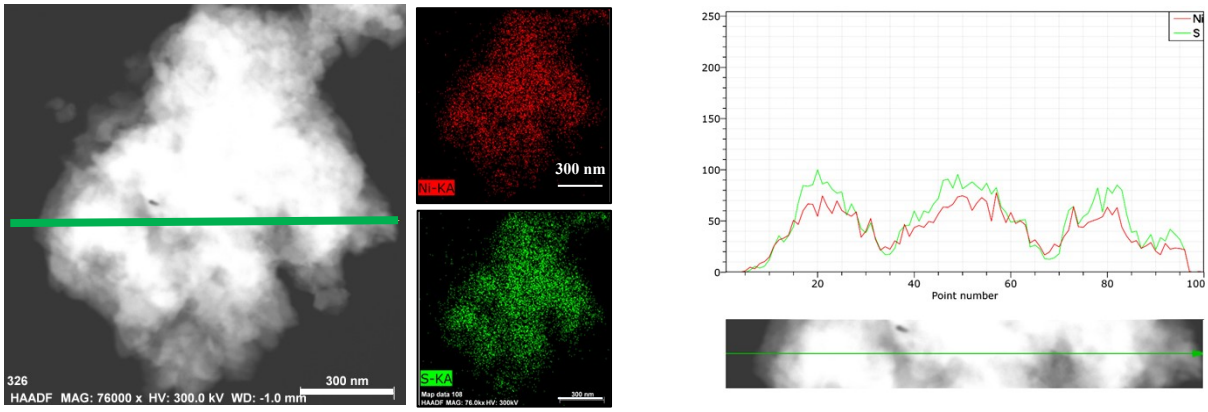


Figure S2. EDS mapping in STEM mode of nickel disulphide respectively.

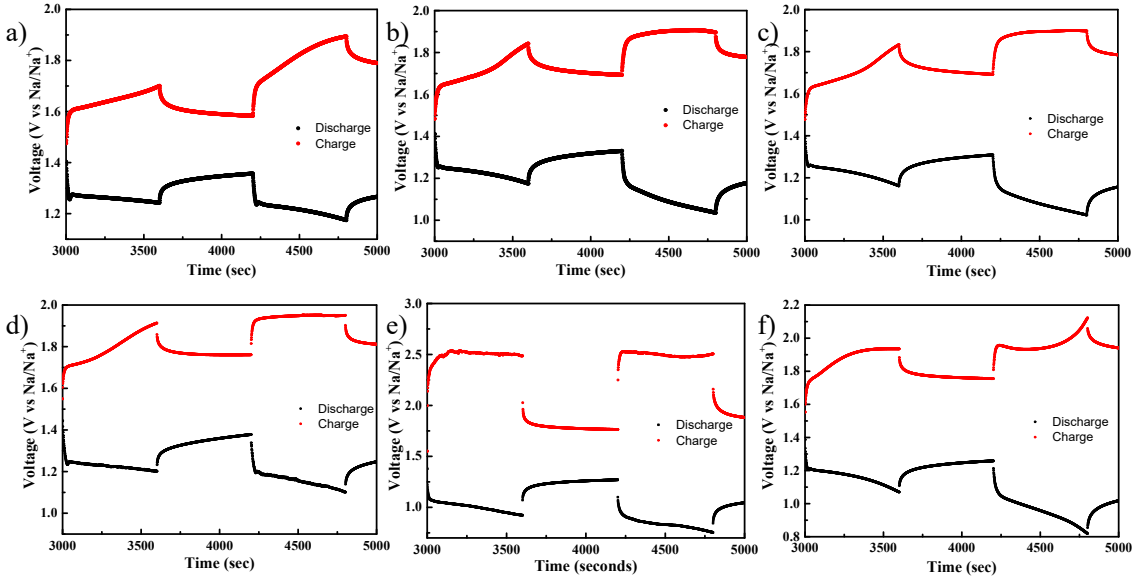
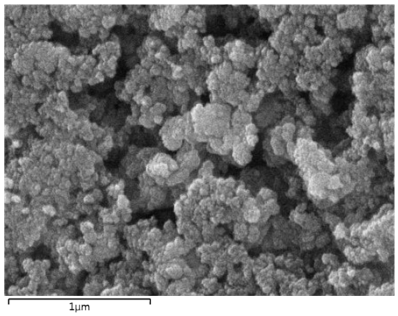
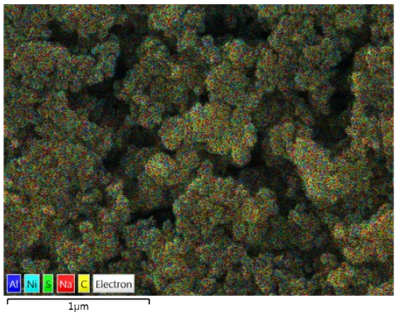


Figure S3. GITT profile of NiS_2 on different current collector: a) C/Al foil, b) nickel foil, c) SS foil, d) Ti foil, e) Al foil and f) CNT coated Al foil in ether electrolyte.





Element	Wt%
C	41.51
Na	28.42
Al	0.23
S	11.99
Ni	17.86
Total:	100.00

Figure S4. EDS mapping of the electrode after 50 cycles in ether electrolyte.

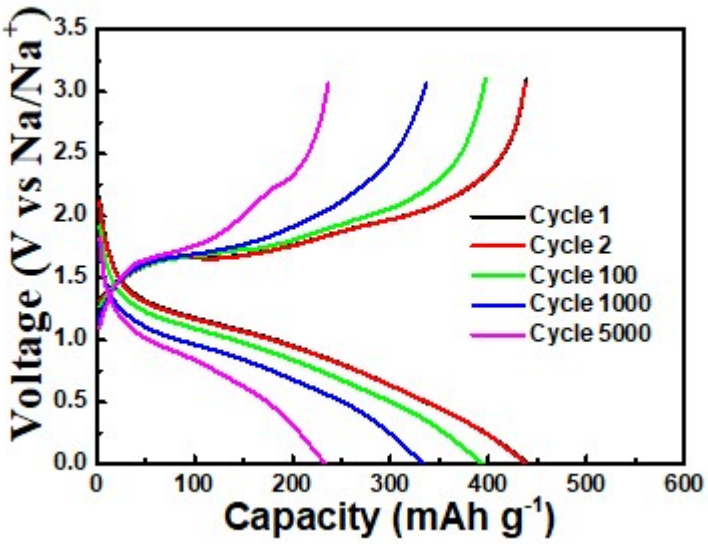


Figure S5. Corresponding voltage profile of NiS_2 electrode on C/Al current collector in ether electrolyte while long-term cycling at 50 Ag^{-1}.

Table S1. Comparison of the previous report of nickel disulphide (NiS_2) as anode material for sodium-ion batteries.

Electrode	Electrolyte	Carbon	Current collector	Voltage window	First reversible capacity (current density)	Cycle performance mAh/g (cycle number, current density)	Rate performance	Ref
NiS_2-GNS	1 M $NaClO_4$ in EC:DMC +5 % FEC	50 %	stainless steel mesh	_	407 (100 mA/g)	313(200,100 mA/g)	168 (1614 mA/g)	S1
NiS_2@CoS_2 hetero-nanocrystals	1.25 M $NaPF_6$ in EMC	51 %	copper foil	0.01–3.0 V	_	600(250,1000 mA/g)	560 @ 5 A/g)	S2
Ni-MOFs-derived NiS_2	1 M $NaClO_4$ in EC:DEC+ 1 % FEC	31.2 %	copper foil	0.01–3.0 V	441 (mA/g)	186.9 (100, 500mA/g)	209.8 @ 0.5 A/g)	S3
Mesoporous NiS_2 Nanospheres	1 M $NaClO_4$ in DEGDME	Present but not mentioned	Titanium foil	0.4-2.9 V	692 (100 mA/g)	319 (1000, 500 mA/g)	253 @ 5A/g	S4
Yolk–Shell NiS_2 Nanoparticle	1 M $NaClO_4$ in EC:PC+ 2 % FEC	61 %	Free standing	0.01–3 V	679 (0.1C)	275 (5000, 5C)	245 @ 10C	S5
Hollow NiS_2 spheres	1.0 M $NaPF_6$ in DEGDME	17 %	Copper foil	0.05−3 V	746(100 mA/g)	530 (300,1A/g)	527.8 @2A/g	S6
NiS_2/nitrogen doped carbon hybrid	1 M $NaClO_4$ in EC:PC+ 5 % FEC	26 %	Copper foil	0.005-3 V	559.1 (100 mA/g)	356 (300, 500 mA/g)	294 @ 3A/g	S7
NiS_2 in N-doped carbon	1 M $NaClO_4$ in EC:PC+ 5 % FEC	50.6 %	Copper foil	0.01−3 V	669(100 mA/g)	580(100, 100mA/g)	448 @1.6 A/g	S8
NiS_2NP/p-CNF	1 M $NaClO_4$ in EC:PC+ 5 % FEC	54 %	Copper foil	0.01−3 V	628 (100 mA/g)	200(2000, 2A/g)	300@2A/g	S9

NiS_2 nanosheets on carbon micro tube	1M $NaClO_4$ in EC/DMC + 5%FEC	Present but not mentioned	Copper foil	0.01−3 V	926 (100 mA/g)	640 (5000, 1A/g)	431 @ 8A/g	S10
SnS_2/NiS_2 hetero-nanosheet arrays	1 M $NaPF_6$ in PC + 5 % FEC	45 %	Free standing	0.005–3.0 V	857 (200 mA/g)	588 (100, 0.5 A/g)	360 @ 5A/g	S11
NiS_2	1M $NaCF_3SO_3$ in DEGDME	Present but not mentioned	Copper foil	0.005–3.0 V	~700 (1000 mA/g)	480(200, 1 A/g)	_	S12
NiS_2/RGO	1M $NaCF_3SO_3$ in DEGDME	23.4 %	Copper foil	0.01-3.0 V	785.79 (100 mA/g)	267 (50, 0.1 A/g)	300 @ 5 A/g	S13
NiS_2/Graphene	1 M $NaClO_4$ in EC/DEC + 5%FEC	25 %	Not mentioned	0.05-3.0 V	1213 (100 mA/g)	900.7 (100, 0.1 A/g)	580.6 @ 5 A/g	S14
NiS_2 nanosheet arrays	1 M $NaClO_4$ in PC + 5%FEC	Present but not mentioned	SS	0.01- 3.0 V	783.16 (0.1C)	469.9 (100, 0.1C)	492 @5C	S15
G/NiS_2-MoS_2	1 M $NaClO_4$ in EC/DEC	Present but not mentioned	Cu foil	0.01- 3.0 V	509.6 (500 mA/g)	337(500, 0.5A/g)	424.5 @ 2A/g	S16
NiS_2 nanospheres	1 M $NaClO_4$ in DME	21.49%	Cu foil	0.01- 3.0 V	591 (200 mA/g)	436.3 (800, 1A/g	411 @ 2A/g	S17
This Report	1M $NaPF_6$ in DME	_	Cu foil	0.01- 3.0 V	812 (1000 mA/g)	814 (100, 1A/g)	132 @100 A/g	
	1 M $NaPF_6$ in EC/DEC		Cu foil	0.01- 3.0 V	629 (1000 mA/g)	25 (100, 1A/g)	_	
	1M $NaPF_6$ in DME		C/Al foil	0.01- 3.0 V	768 (1000 mA/g)	241(50000, 50 A/g)	129 @ 100 A/g	

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