

Supporting Information

Controllable Synthesis of Nickel Sulfide Nanocatalysts and their Phase-Dependent Performance for Overall Water Splitting

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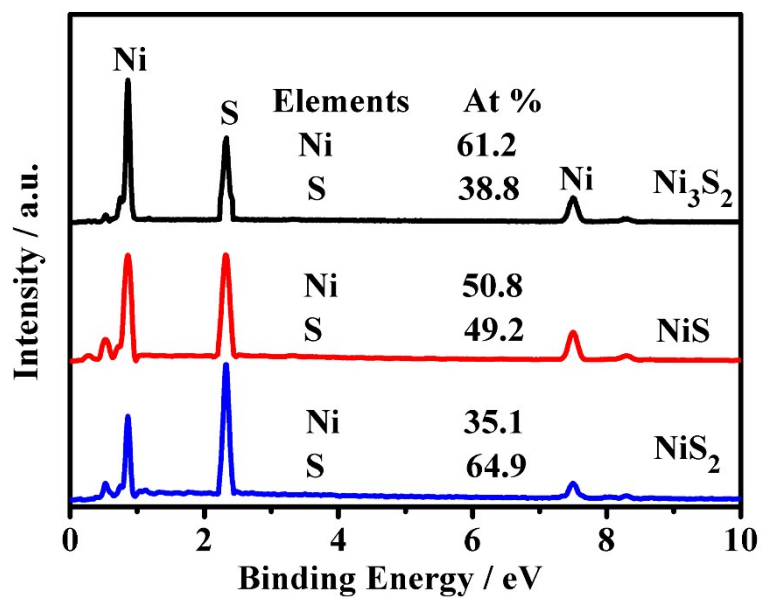


Figure S1 EDX spectra of Ni₃S₂, NiS and NiS₂ nanocrystals.

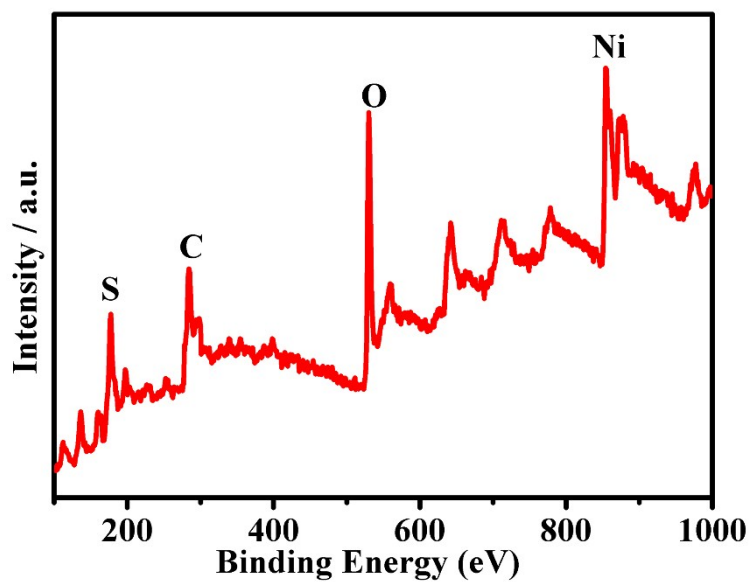


Figure S2 XPS survey spectrum of Ni₃S₂ nanocrystals.

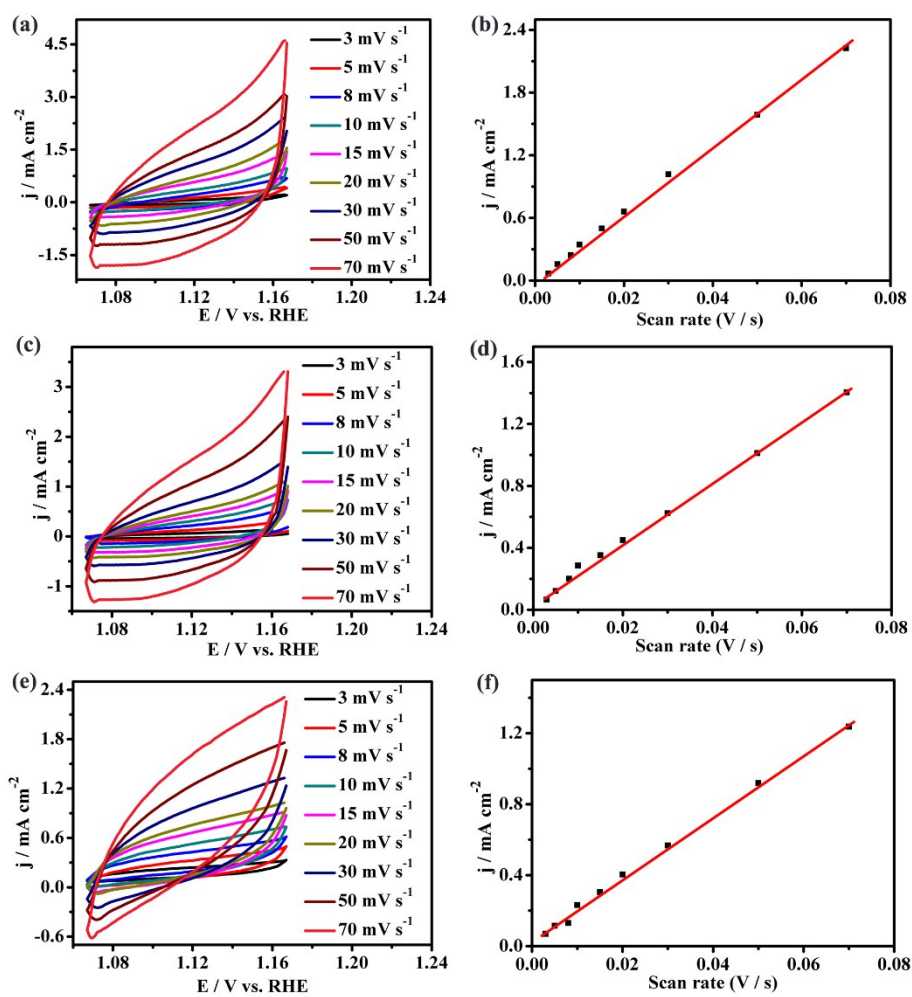


Figure S3 Cycle voltammograms from 1.067 to 1.167 V vs RHE in 0.1 M KOH at different scan rates of (a-b) Ni_3S_2 , (c-d) NiS and (e-f) NiS_2 electrodes.

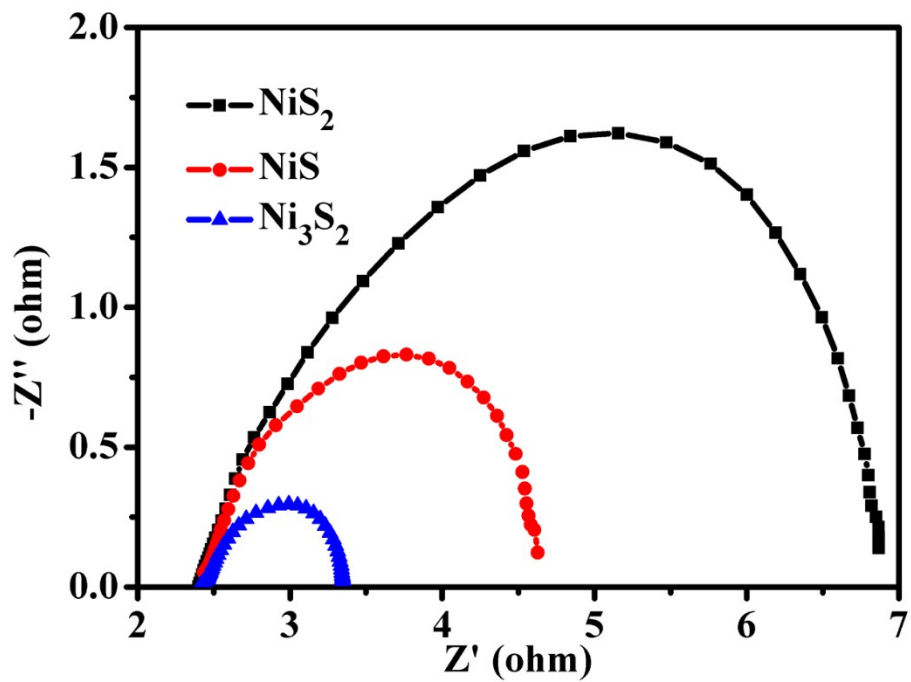


Figure S4 EIS Nyquist plots for Ni_3S_2 , NiS and NiS_2 electrocatalysts.

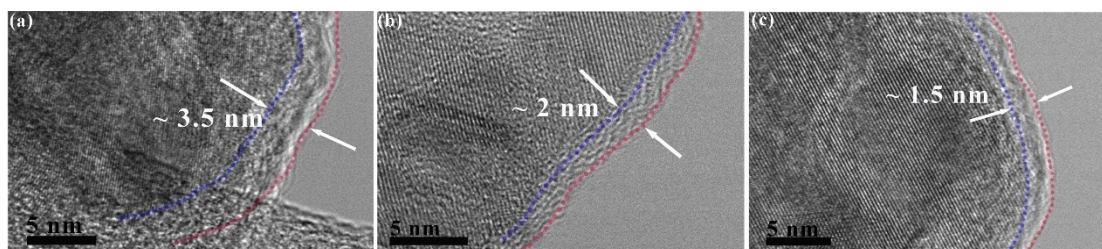


Figure S5 HRTEM images of (a) Ni_3S_2 , (b) NiS , and (c) NiS_2 nanocrystals after 1000 CV cycles.

Table S1 Comparison of HER performances of transition metal compounds electrocatalysts that previously reported in 1.0 M KOH.

Catalysts	Electrode	Tafel (mV dec ⁻¹)	Overpotential (mV) at 10 mA cm ⁻²	Refs
Ni ₃ Se ₂ film	Cu foam	98	100	1
Co-NiSe ₂	Ti plate	63	64	2
CoNiSe ₂	Ni foam	40	120	3
α -NiOOH	Ni foam	119	240	4
MoS ₂ /Ni ₃ S ₂	Ni foam	88	280	5
NiSe/NF	Ni foam	120	150	6
Ni ₂ P/NiFe	Ni foam	67	75	7
NiFe-LDH	Ni foam	70	160	8
Ni _{1-x} Co _x Se ₂	Ni foam	52	140	9
CoS _{2x} Se _{2(1-x)}	Carbon paper	44	120	10
Ni ₃ S ₂	Carbon cloth	67	112	TW*
NiS	Carbon cloth	93	160	TW*
NiS ₂	Carbon cloth	110	227	TW*

Table S2 Comparison of OER performances of transition metal compounds electrocatalysts that previously reported in 1.0 M KOH.

Catalysts	Electrode	Tafel (mV dec ⁻¹)	Overpotential (mV) at 50 mA cm ⁻²	Refs
Ni ₃ Se ₂ film	Cu foam	80	310	1
Co-NiSe ₂	Ti plate	94	300	2
CoNiSe ₂	Ni foam	79	260	3
α -NiOOH	Ni foam	76	350	4
MoS ₂ /Ni ₃ S ₂	Ni foam	83	110	5
NiSe/NF	Ni foam	75	300	6
Ni ₂ P/NiFe	Ni foam	32	210	7
NiFe LDH/NF	Ni foam	86	280	8
Ni-CoSe ₂	FTO	78	380	11
NiSe ₂	Carbon cloth	84	310	12
Ni ₃ S ₂	Carbon cloth	52	330	TW*
NiS	Carbon cloth	92	410	TW*
NiS ₂	Carbon cloth	138	490	TW*

Table S3. Hall measurement data of NiS_x electrocatalysts.

Catalyst	Resistivity / Ω cm	Carrier concentration / cm ³
Ni ₃ S ₂	0.852	2.360×10^{19}
NiS	4.783	6.937×10^{18}
NiS ₂	7.561	3.752×10^{18}

Table S4 Overall watersplitting performances of transition metal compounds electrocatalysts that previously reported in 1.0 M KOH.

Catalysts	Electrode	Current density (mA cm ⁻²)	Potential (V)	Refs
Ni ₃ Se ₂ film	Cu foam	10	1.65	1
Co-NiSe ₂	Ti plate	10	1.62	2
CoNiSe ₂	Ni foam	10	1.59	3
α-NiOOH	Ni foam	10	1.66	4
MoS ₂ /Ni ₃ S ₂	Ni foam	10	1.56	5
NiSe/NF	Ni foam	10	1.63	6
Ni ₂ P/NiFe	Ni foam	10	1.51	7
NiFe-LDSH	Ni foam	10	1.53	8
Co ₂ P	Ni foam	10	1.57	13
Co-NiSe ₂ /C	Ni foam	10	1.61	14
Ni ₃ S ₂	Carbon cloth	10	1.63	TW*
NiS	Carbon cloth	10	1.74	TW*
NiS ₂	Carbon cloth	10	1.85	TW*

Supplementary References

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