Electronic Supplementary Material (ESI) for Nanoscale.

Supporting information

Insight into the hydrogen evolution reaction of nickel dichalcogenides nanosheets: activities related to non-metal ligands

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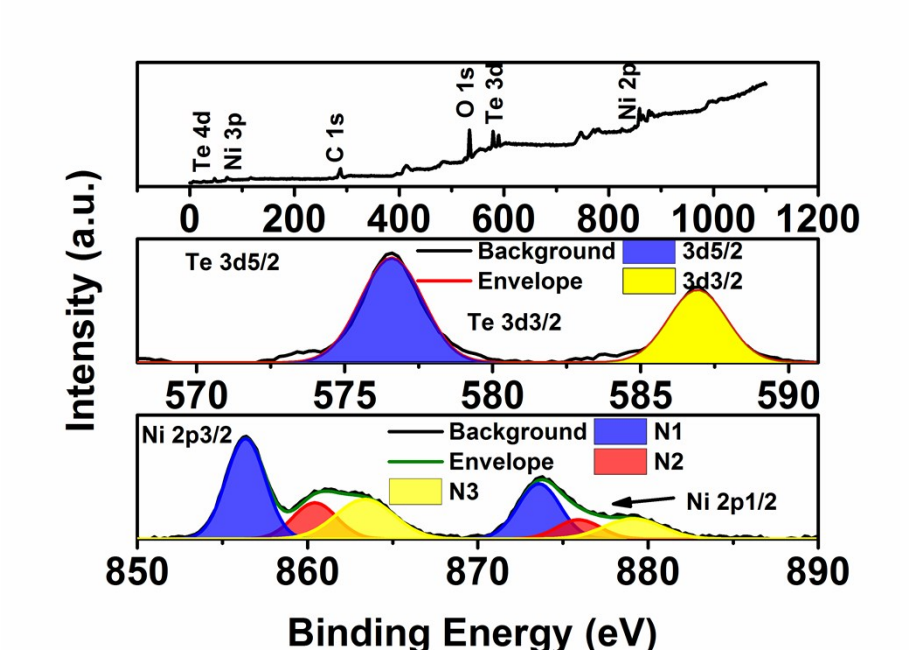

Figure S1. XPS spectrum of $NiTe_2$

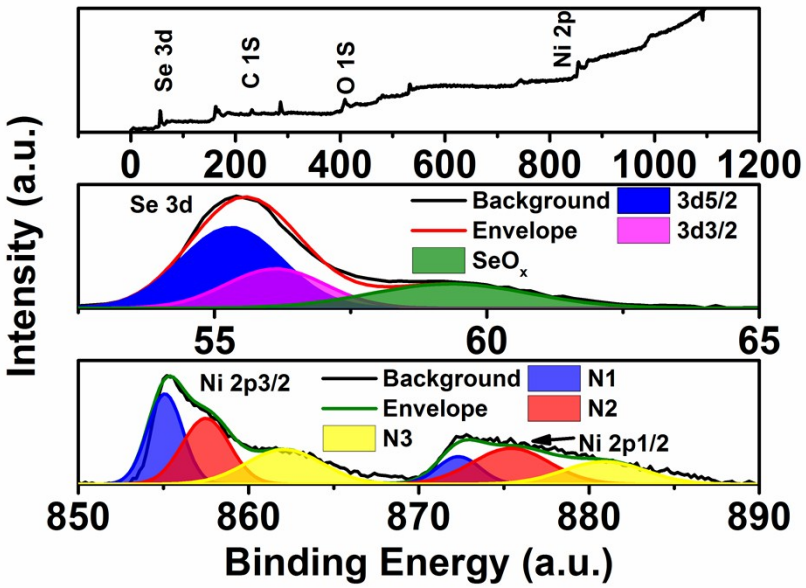

Figure S2. XPS spectrum of $NiSe_2$

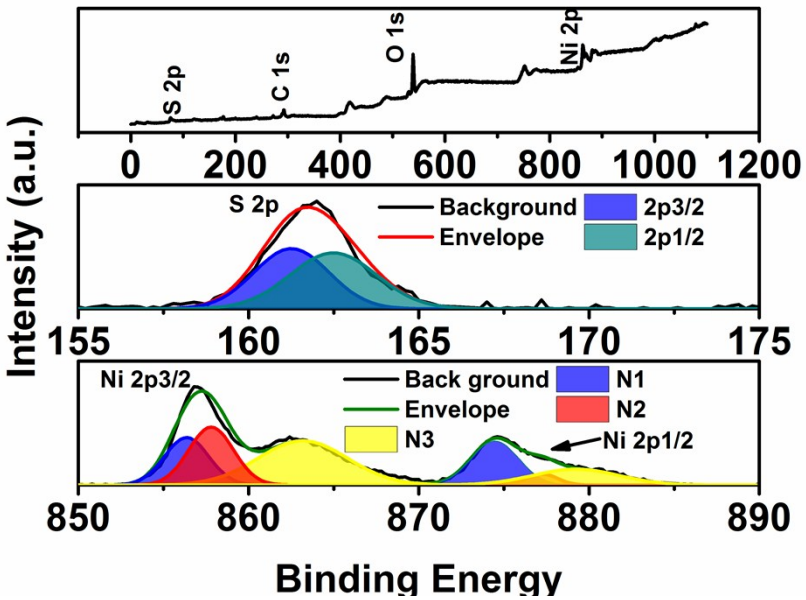

Figure S3. XPS spectrum of NiS_2

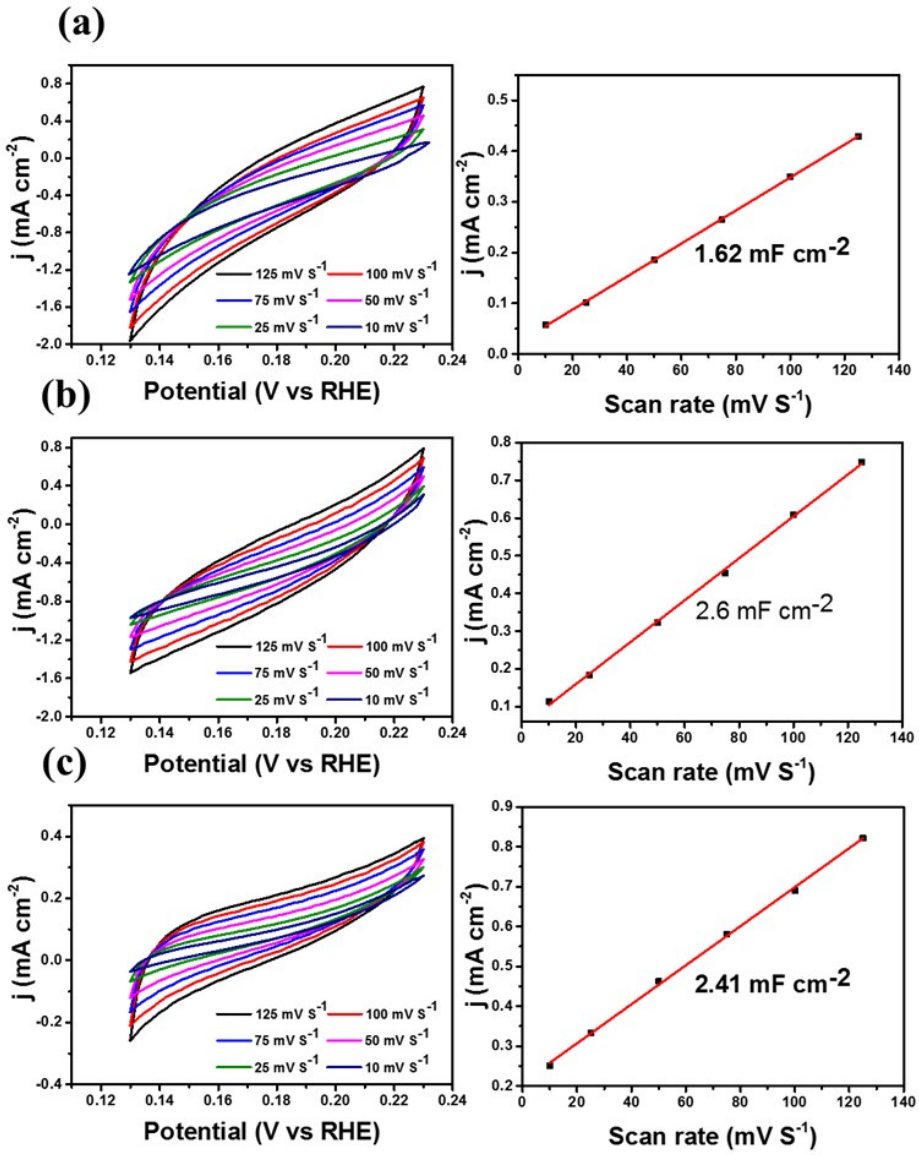

Figure S4. CV curves and current density at 0.18 V plotted against scan rate of (a) $NiTe_2$ (b) $NiSe_2$ and (c) NiS_2 in 0.5M H_2SO_4

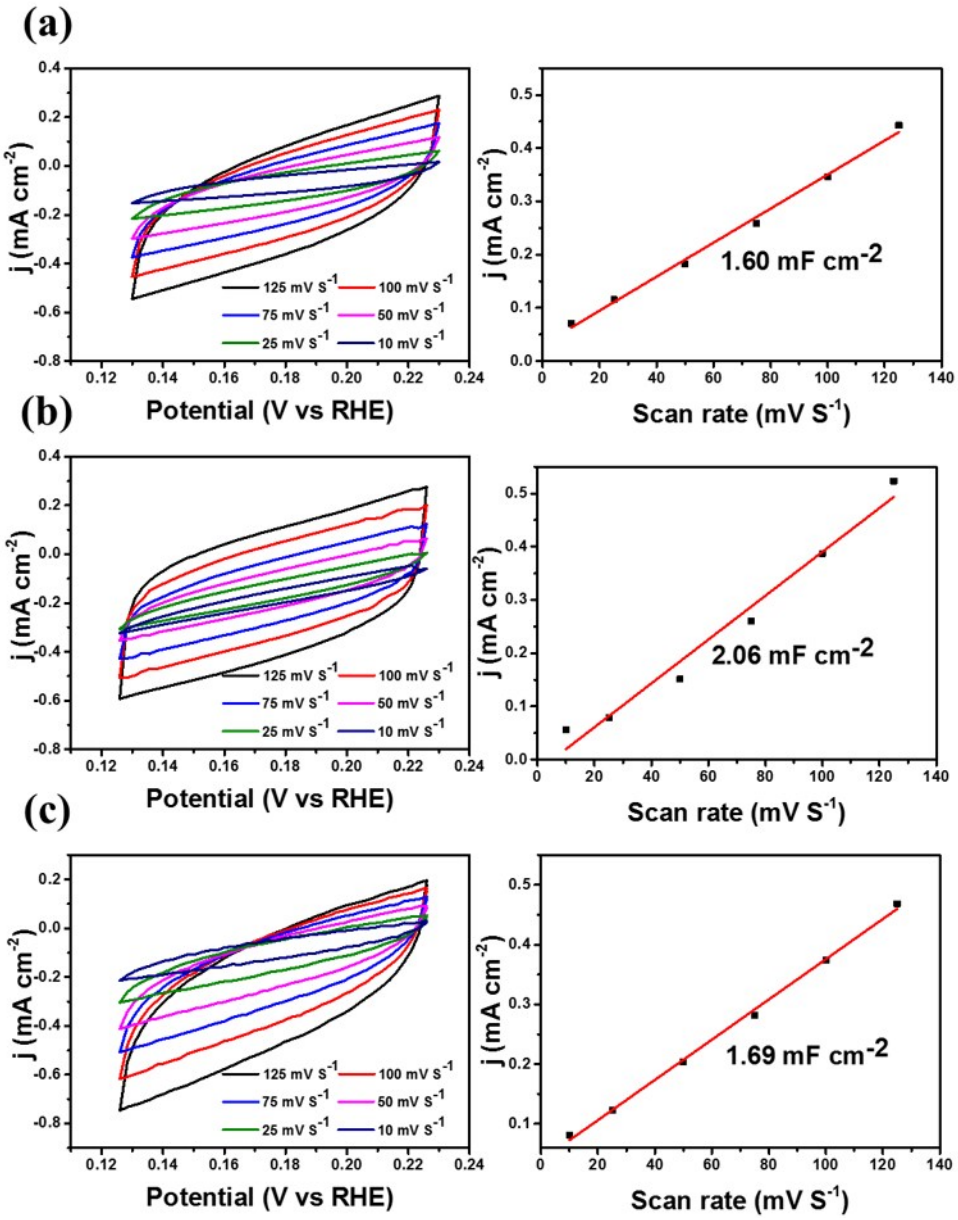

Figure S5. CV curves and current density at 0.18 V plotted against scan rate of (a) $NiTe_2$ (b) $NiSe_2$ and (c) NiS_2 in 1M KOH

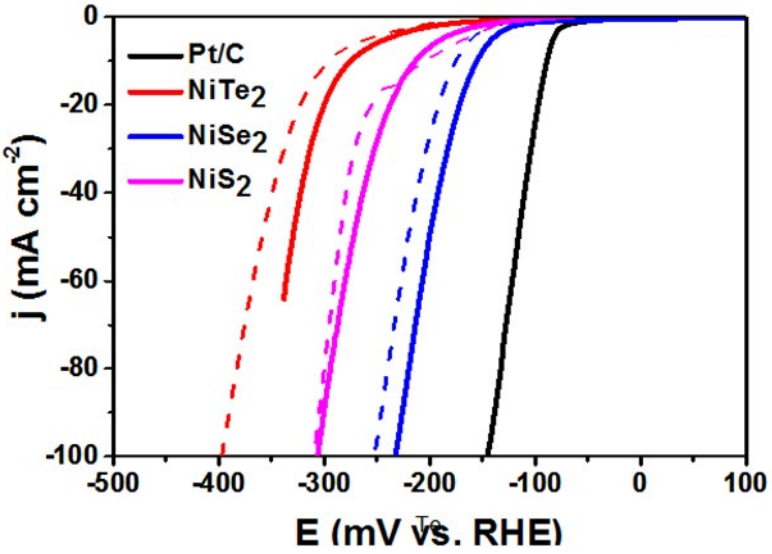

Figure S6. LSV curves before (solid line) and after (dash line) long-term test

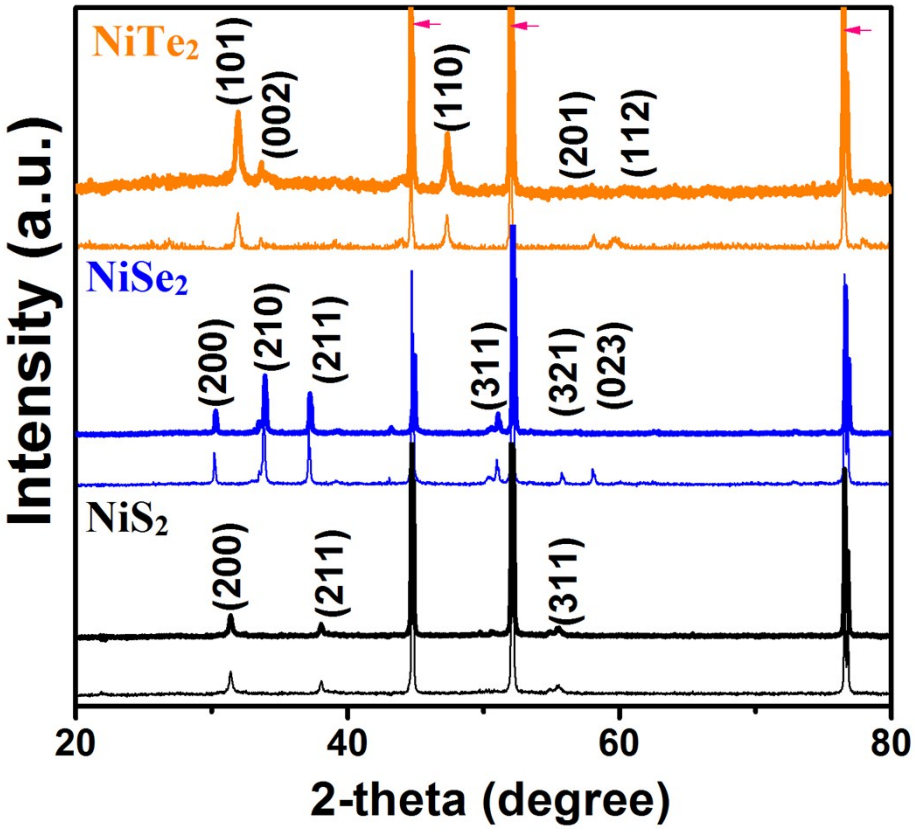

Figure S7. PXRD patterns of $NiTe_2$, $NiSe_2$, and NiS_2 before (thin line below) and after (thick line) long-term test

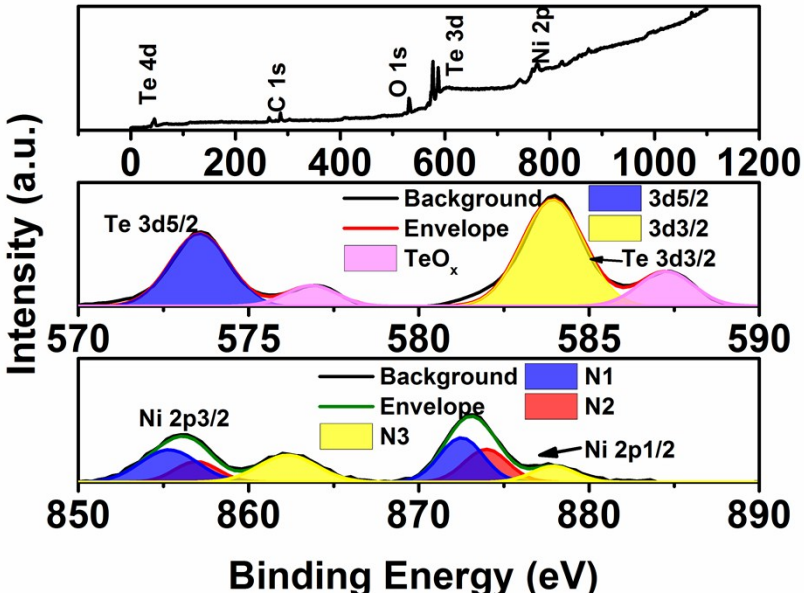

Figure S8. XPS spectrum of $NiTe_2$ after long-term test

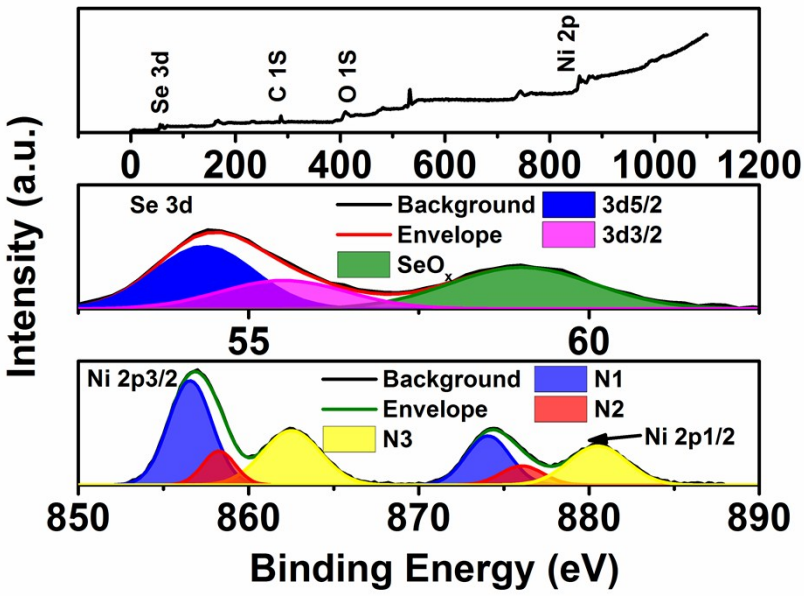

Figure S9. XPS spectrum of NiS e_2 after long-term test

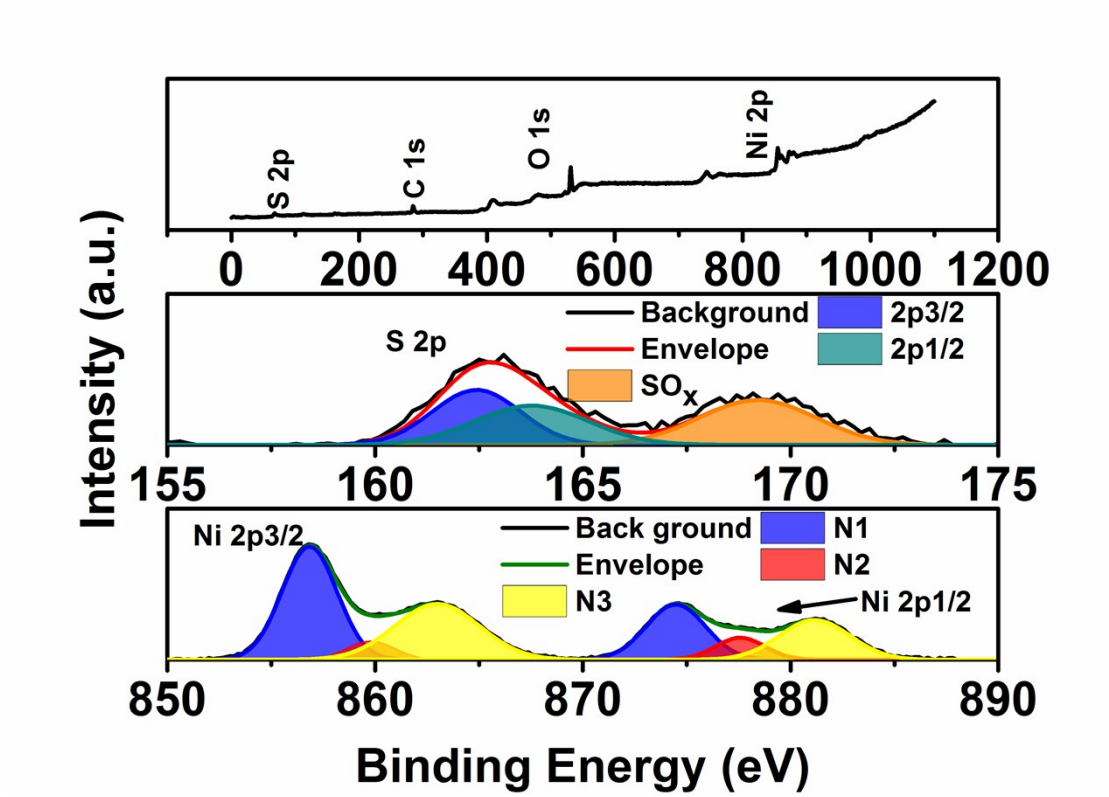

Figure S10. XPS spectrum of $NiTe_2$ after long-term test

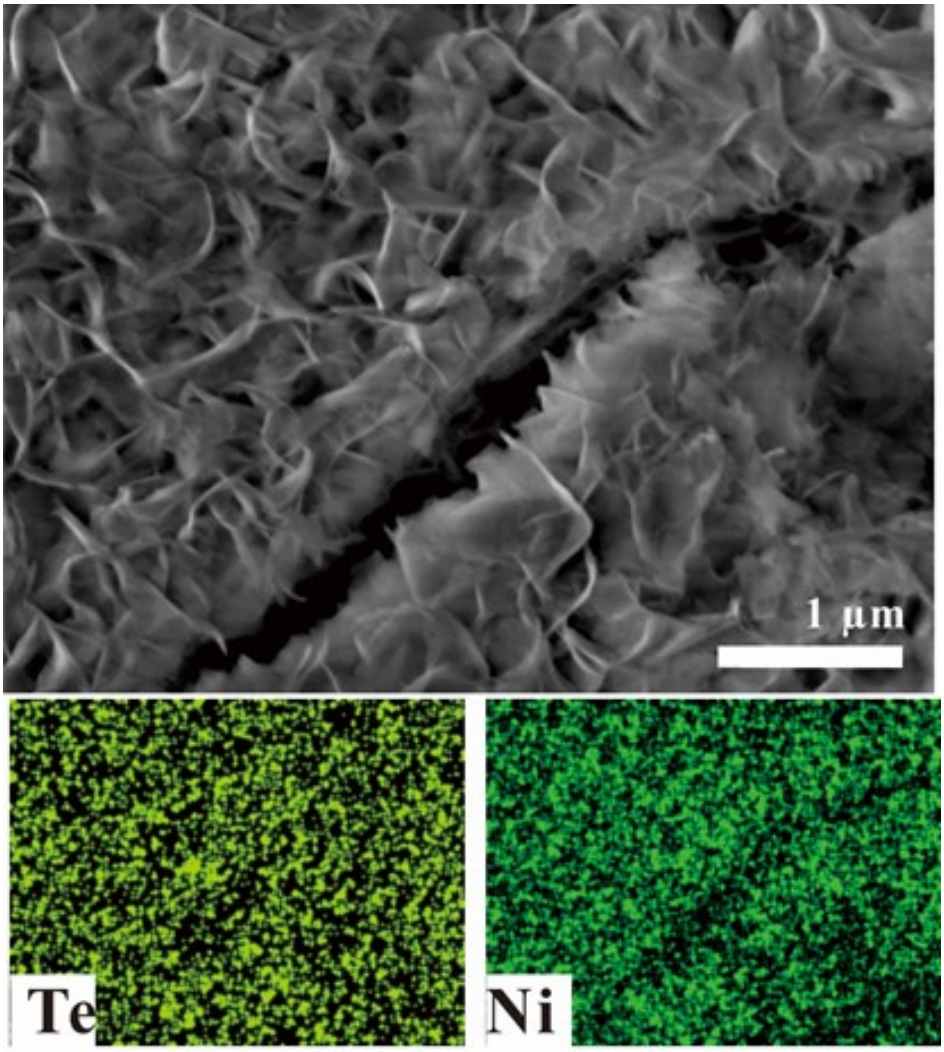

Figure S11. SEM and EDS mapping of $NiTe_2$ after long-term test

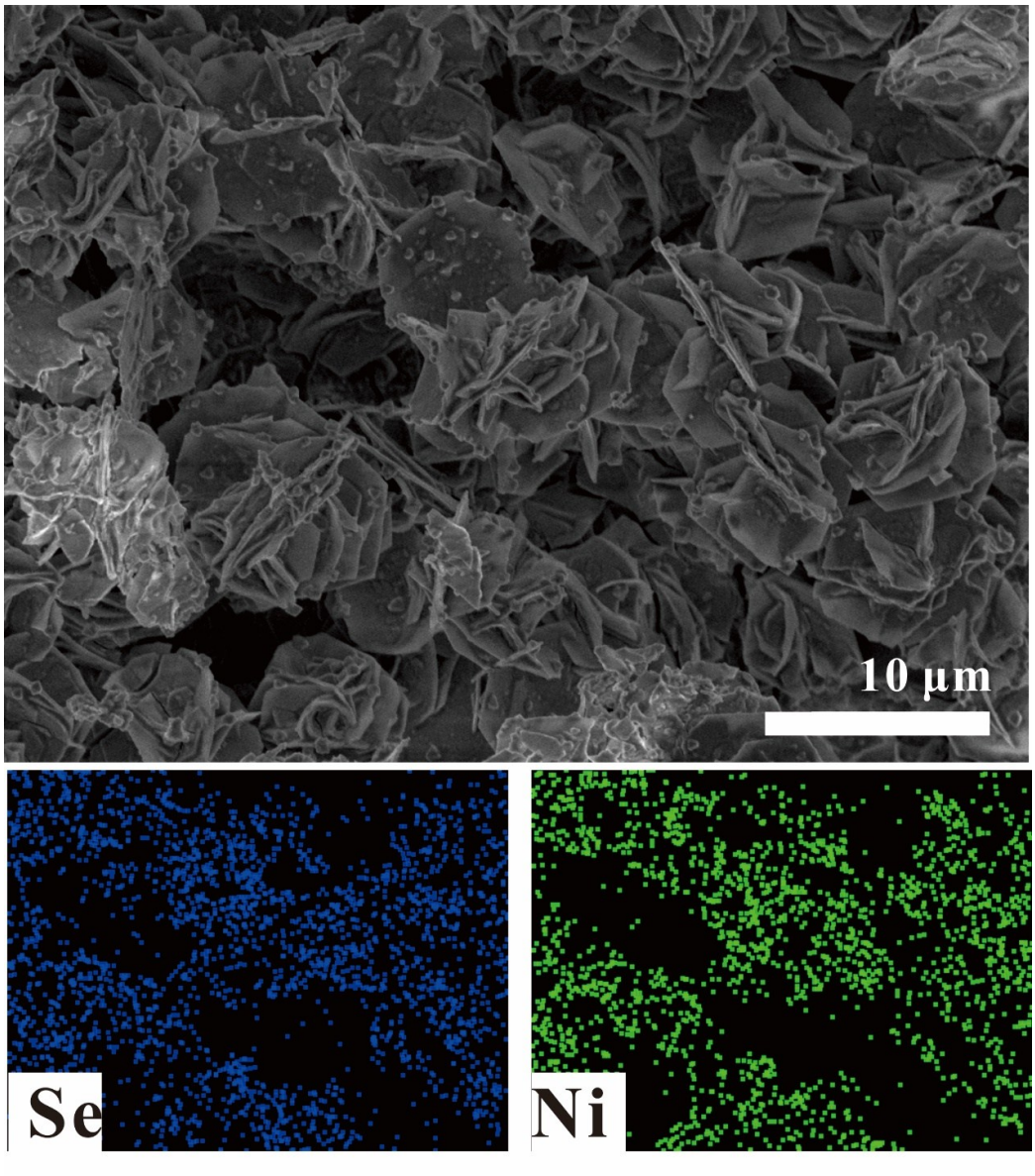

Figure S12. SEM and EDS mapping of $NiSe_2$ after long-term test

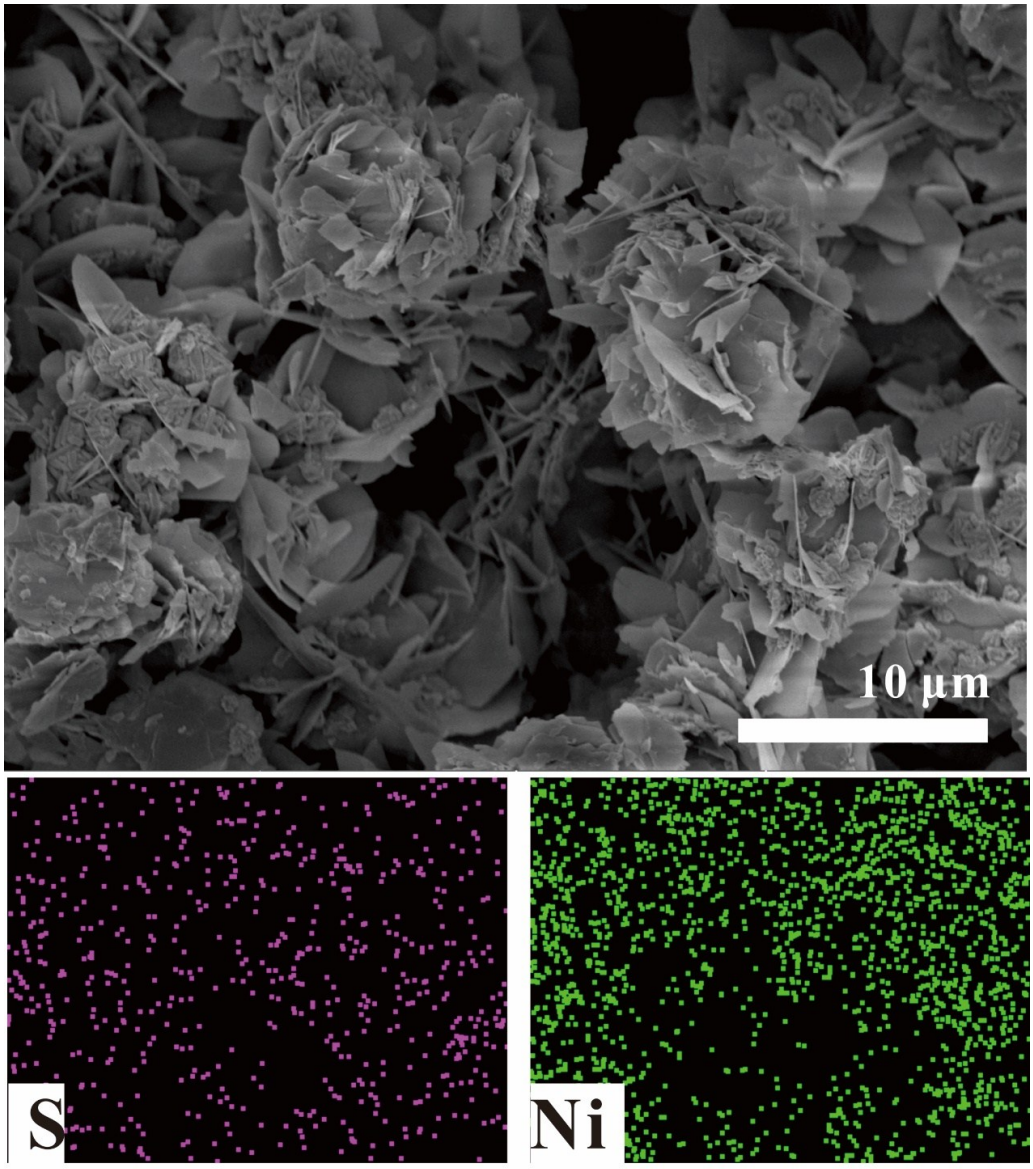

Figure S13. SEM and EDS mapping of NiS_2 after long-term test

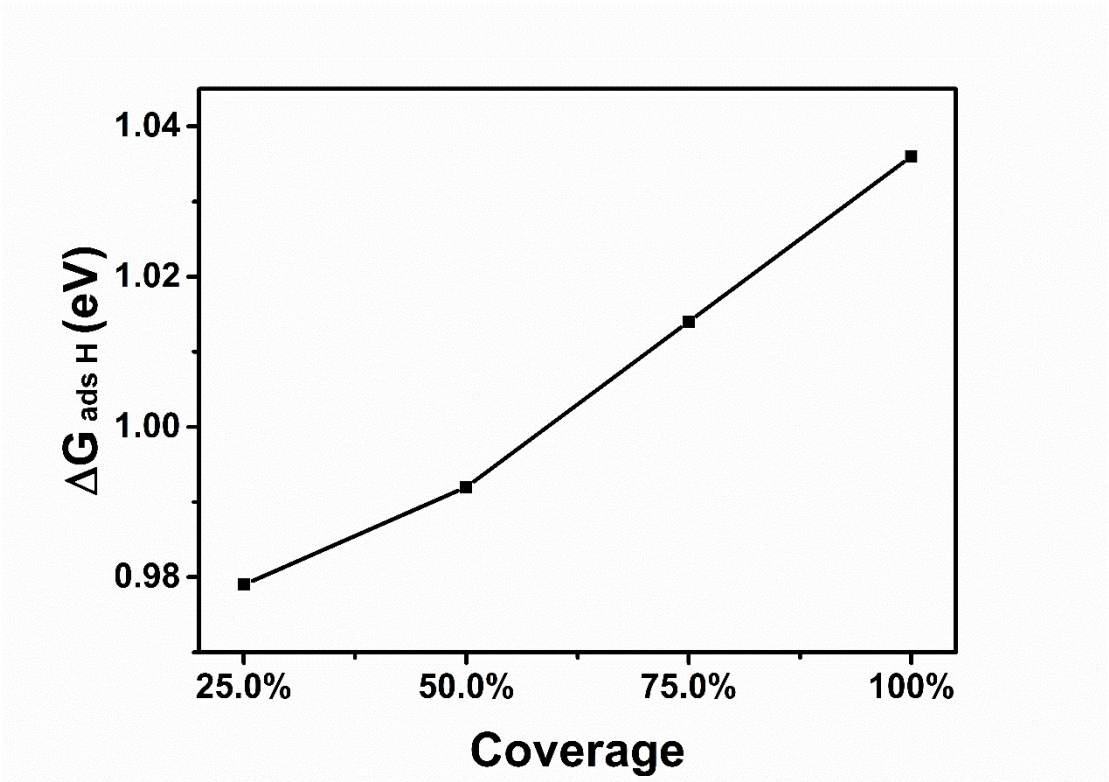

Figure S14. Hydrogen adsorption energy of $NiTe_2$ with different hydrogen coverage

Table S1. Comparison between different nickel chalcogenides for HERs

Catalyst	Substrate	Electrolyte PH	η [mV]@ j [mA cm^{-2}]	Tafel slope [mV/dec]	Ref.
NiS	Glass carbon electrode	14	454@10	124	1
NiS_2		14	474@10	128	
Ni_3S_2		14	335@10	97	
NiS_2	Graphite substrate	0	230@1	48	2
NiS_2	Graphite substrate	0	240@10	41	3
		14	310@100	80	
NiS	Glass carbon electrode	0	252@10	88	4
Ni_3S_2		0	270@10	117	
NiS		14	375@10	-	
Ni_3S_2		14	400@2.5	-	
$NiSe_2$	Nickel foam	0	143@10	49	5
$NiSe_2$	Carbon cloth	0	117@10	32	6
$NiSe_2$	Glass carbon electrode	0	190@10	44	7
$NiSe_2$	Ti foil	14	70@10	82	8
$NiSe_2$	Carbon cloth	0	135@10	37.3	9
Ni_2Se_3	Nickel foam	14	425@100	118	10
$CoTe_2$	Glass carbon electrode	0	246@10	45.9	11
$CoTe_2$	Carbon fiber paper	0	309@10	63.2	12
NiS_2	Nickel foil	0	213@10	73	This work
$NiSe_2$			156@10	54	
$NiTe_2$			276@10	71	
NiS_2		14	280@10	101	
$NiSe_2$			230@10	96	
$NiTe_2$			326@10	98	

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