Supporting Information for

Se-doped Ni_5P_4 nanocatalysts for high-efficiency hydrogen evolution reaction

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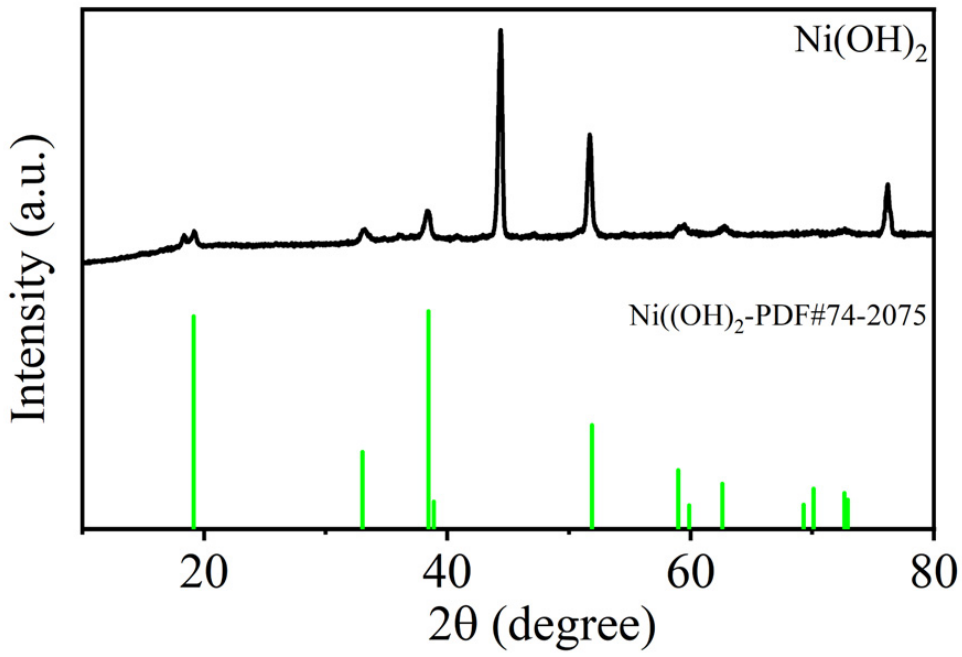

Figure S1 XRD patterns of $Ni(OH)_2$ precursors.

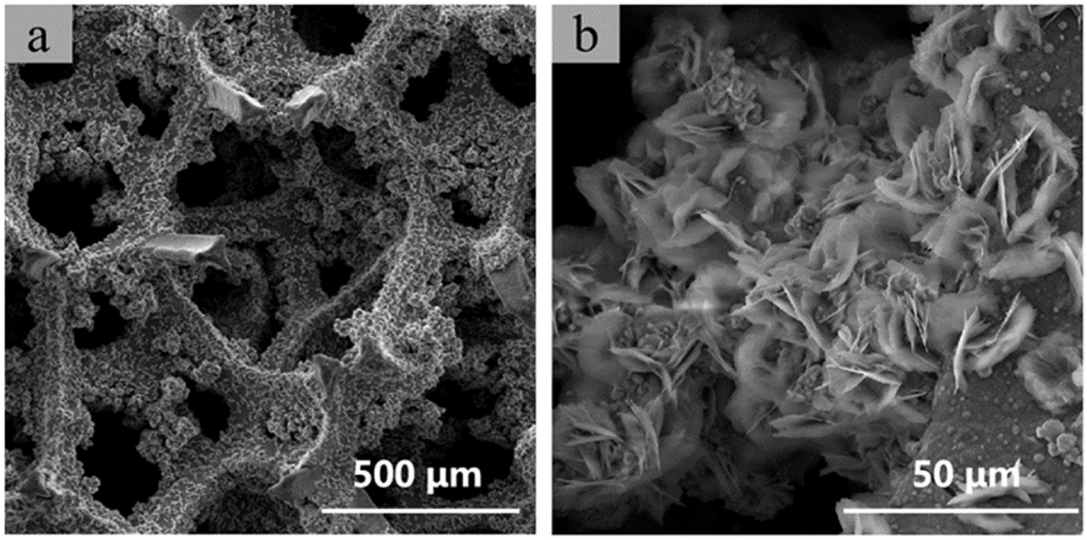

Figure S2 SEM images (a-b) of $Ni(OH)_2$ precursor.

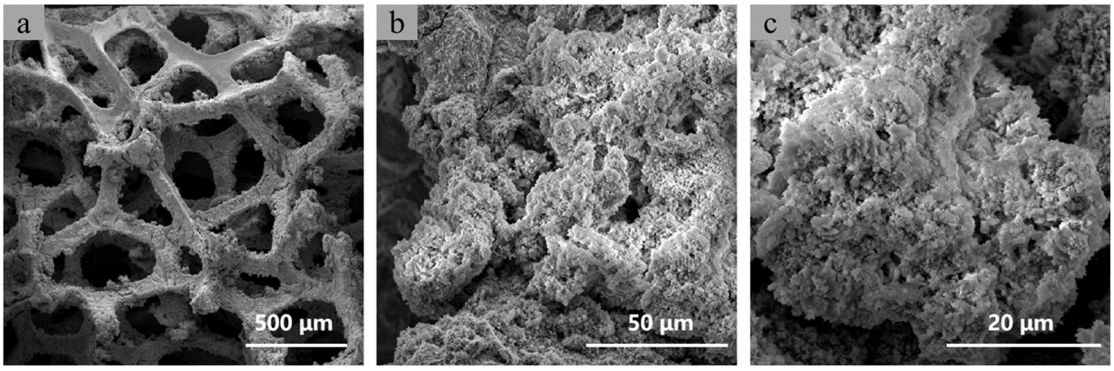

Figure S3 SEM images (a-c) of Ni_5P_4.

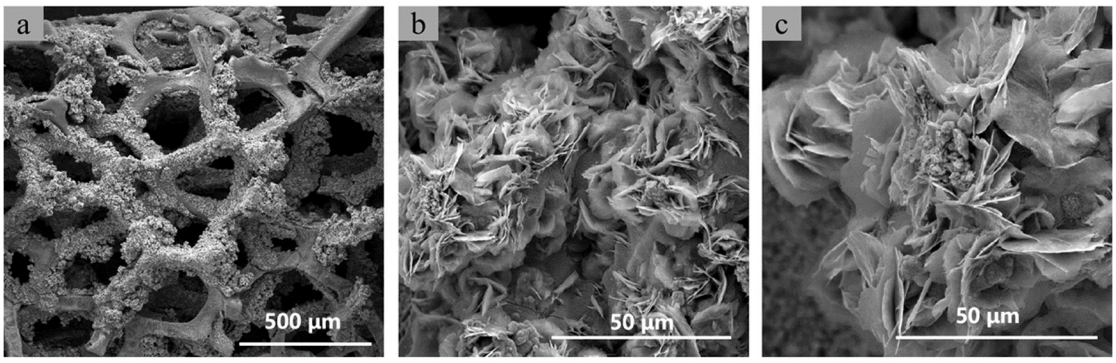

Figure S4 SEM images (a-c) of $NiSe_2$.

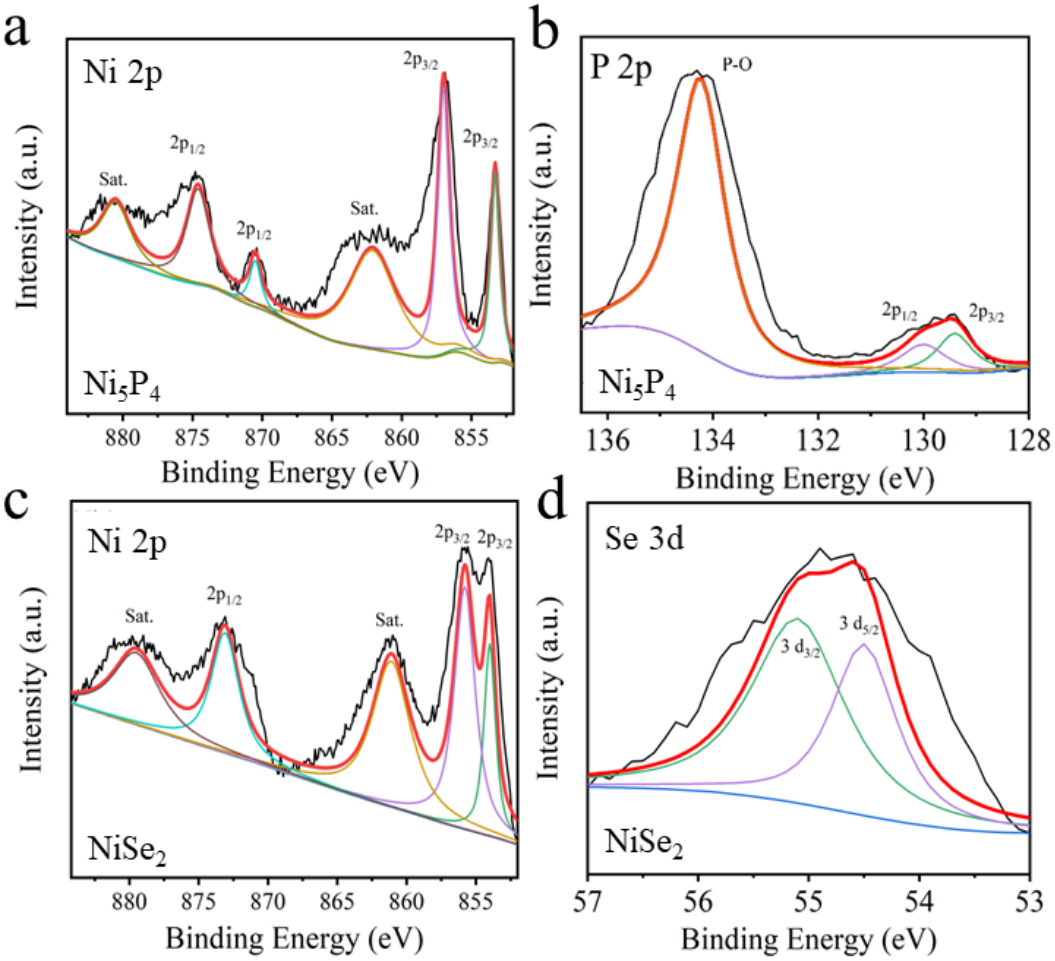

Figure S5 High-resolution XPS spectra of Ni_5P_4 and $NiSe_2$, (a) Ni 2p in pure Ni_5P_4, (b) P 2p in pure Ni_5P_4, (c) Ni 2p in $NiSe_2$, (d) Se 3d in $NiSe_2$

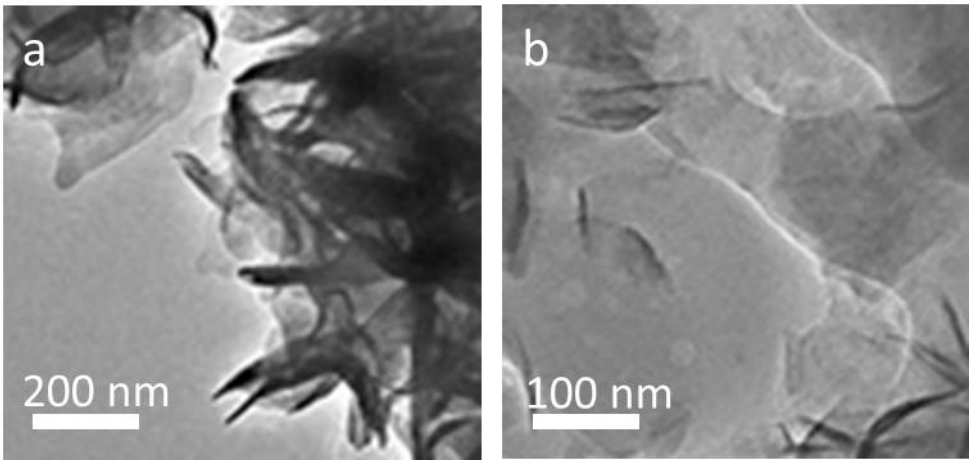

Figure S6 TEM images (a-b) of Ni_5P_4-Se composites.

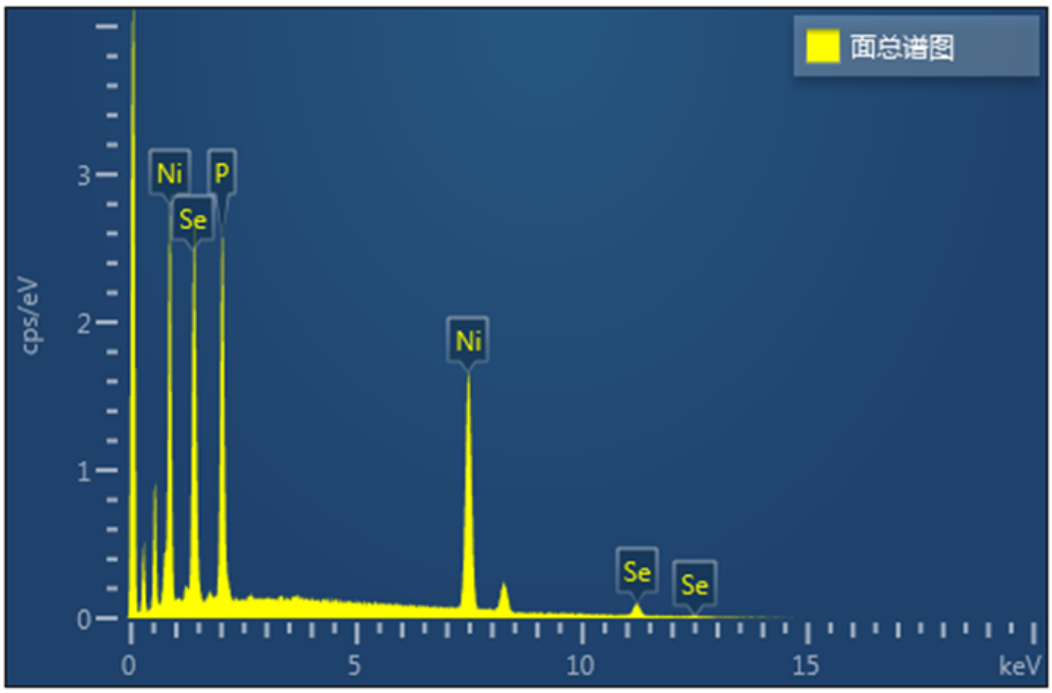

Figure S7 Energy spectrum for Ni_5P_4-Se composites.

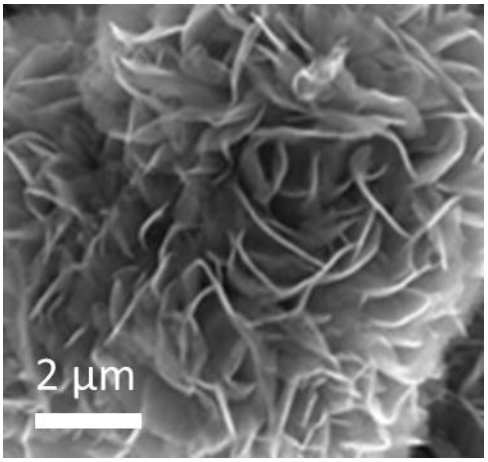

Figure S8 SEM image of Ni_5P_4-Se catalyst after long cycles.

Table S1 Comparison of the catalytic activity of catalysts

Catalyst	Electrolyte	Overpotential (mV vs.RHE)	Tafel (mV dec^{-1})	Reference
PNi_3S_2/NF	1 M KOH	137	147	[1]
NiCo/Sm_2O_3	1 M KOH	276	162	[2]
Ni_2P/LSCN	0.1 M KOH	339	105	[3]
NiFe LDH@DG	1 M KOH	270	110	[4]
Ni_2P nanofilms	0.1 M KOH	315	120	[5]
np-NiFeMoP	1 M KOH	223	180.3	[6]
FeP	1 M KOH	181	134	[7]
$Cu_{0.3}Co_{1.7}P$/NC	1 M KOH	220	122	[8]
Ni_2P	1 M KOH	183	-	[9]
CoNiP-1:1 NWs	1 M KOH	252	128	[10]
Ni_5P_4-Se	**1 M KOH**	**128**	**163.14**	**This work**

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