Supporting Information

Hierarchical Nanoporous V_2O_3 Nanosheets Anchored with Alloy Nanoparticles for Efficient Electrocatalysis

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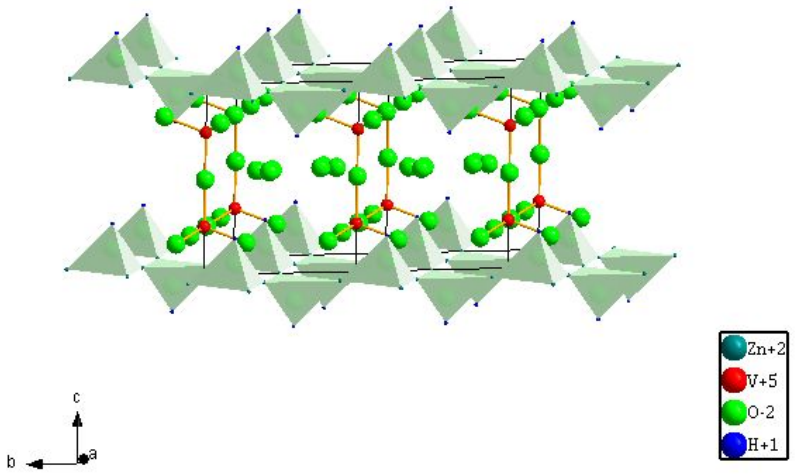

Figure S1 Crystal structure of the VZn-LDHs.

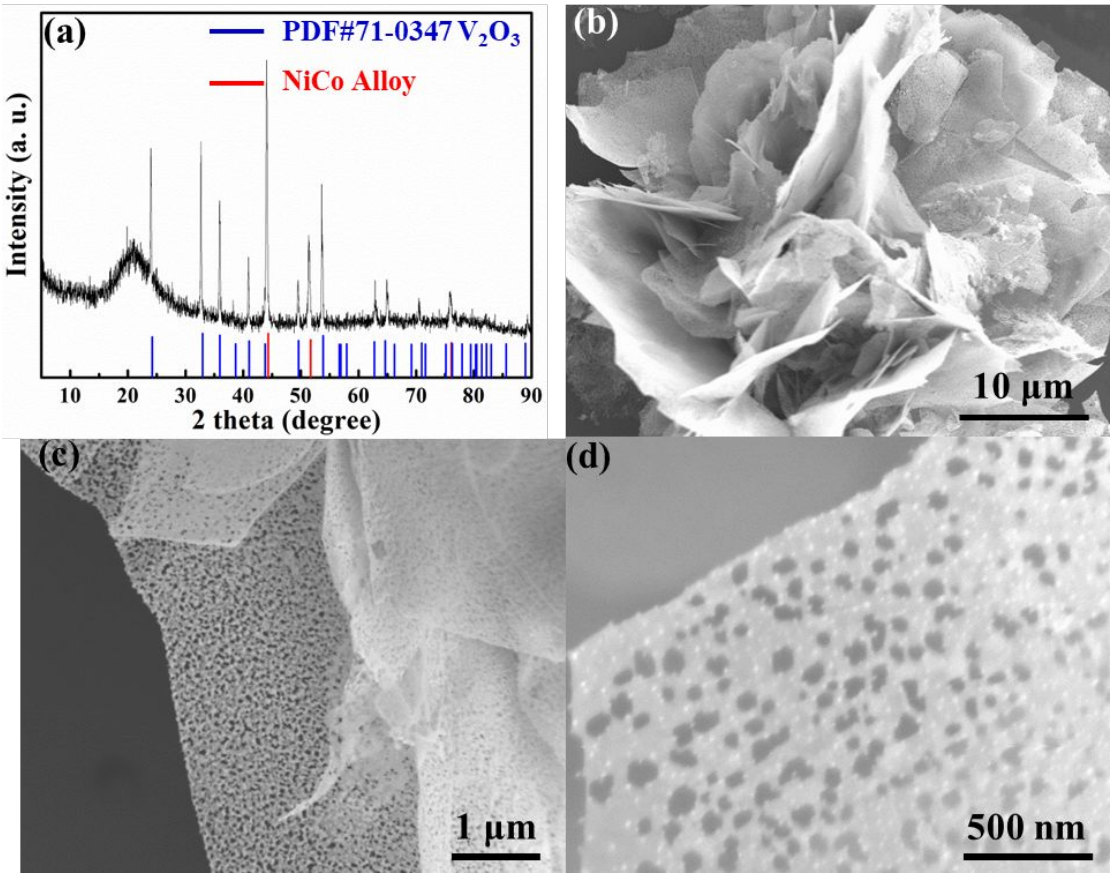

Figure S2 (a) XRD patterns of the NiCo@V_2O_3; (b), (c), and (d) SEM images of NiCo@V_2O_3 nanosheets with different magnification.

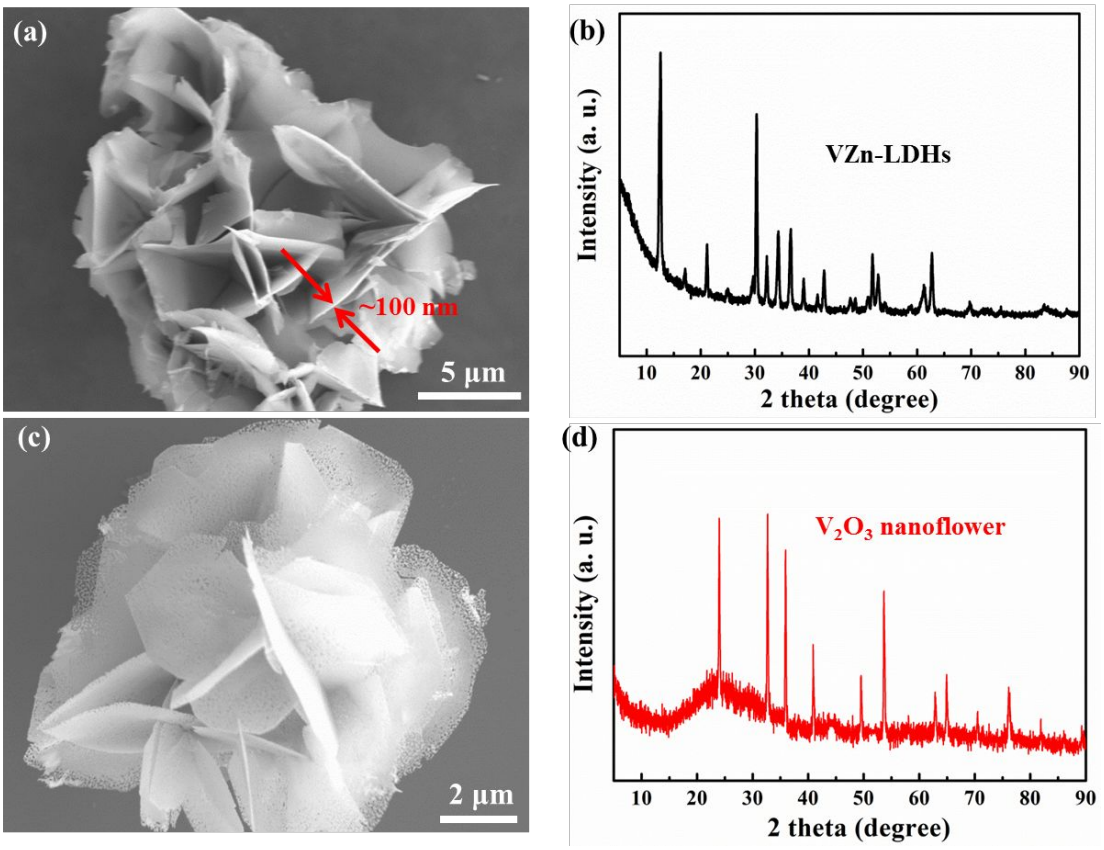

Figure S3 (a) SEM image of VZn-LDHs; (b) XRD patterns of the VZn-LDHs; (c) SEM image of V_2O_3 nanosheets; (d) XRD pattern of the V_2O_3 sheets.

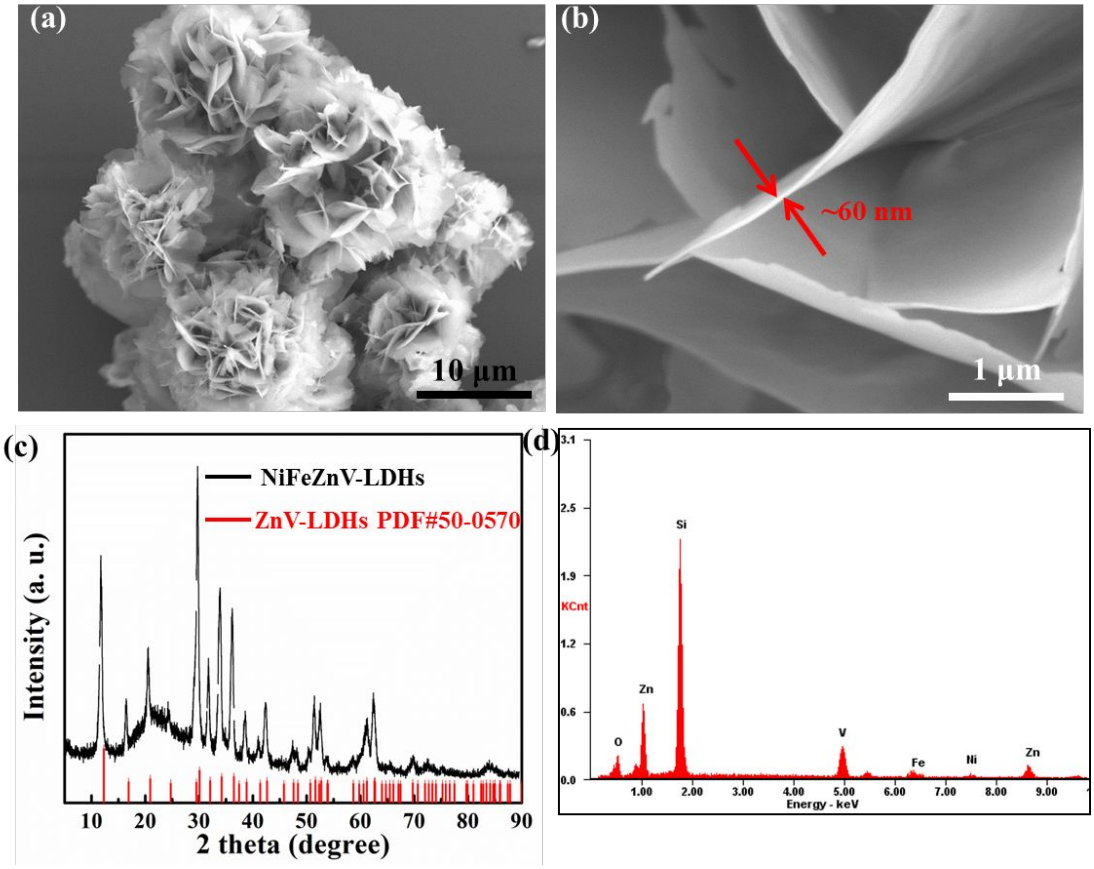

Figure S4 Low- (a) and high-magnification (b) SEM images of NiFeZnV-LDHs precursor; XRD pattern (c) and EDS line profile (d) of the NiFeZnV-LDHs precursor.

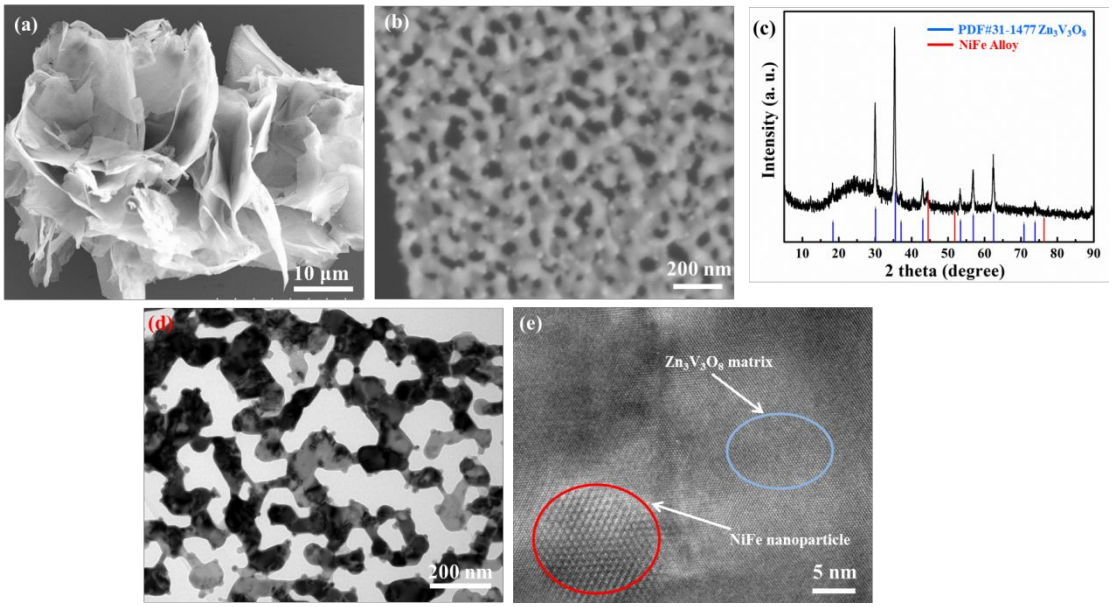

Figure S5 Low- (a) and high-magnification (b) SEM images of NiFe@$Zn_3V_3O_8$; XRD patterns (c), TEM image (d), and HRTEM (e) image of NiFe@$Zn_3V_3O_8$.

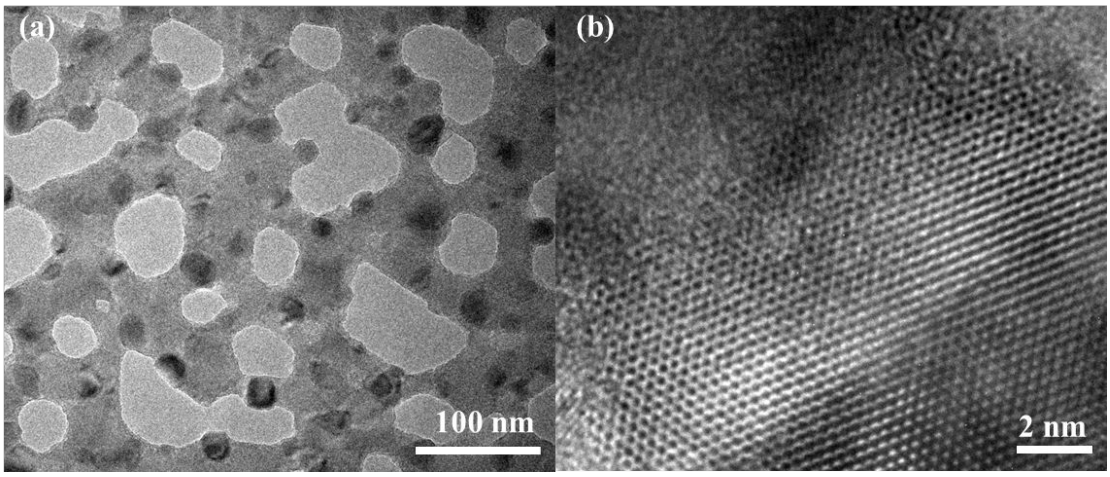

Figure S6TEM image of NiFe@V_2O_3 hybrid (a), and the HRTEM image (b) focused at the edge of the NiFe nanoparticle to discover the crystal defects and lattice distortions.

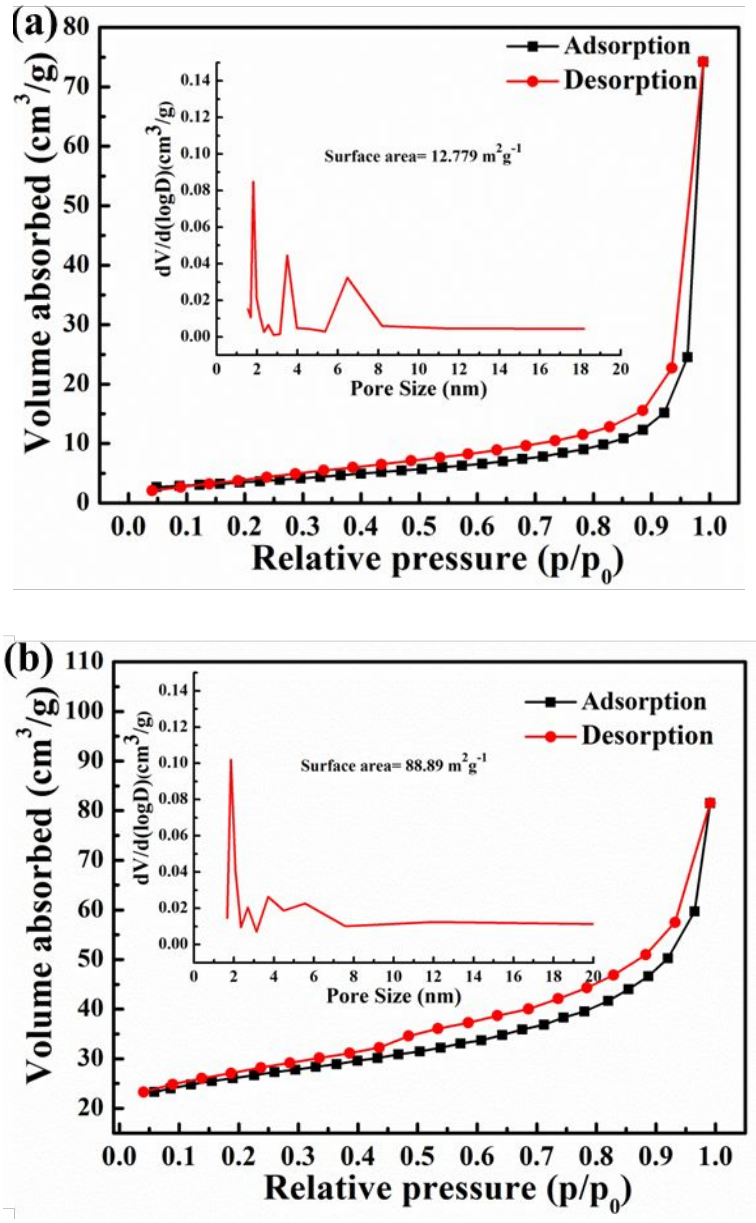

Figure S7 Nitrogen absorption/desorption curves of the NiFe@$Zn_3V_3O_8$ (a) and NiFe@V_2O_3 (b). Insets are the BJH pore size distribution curves.

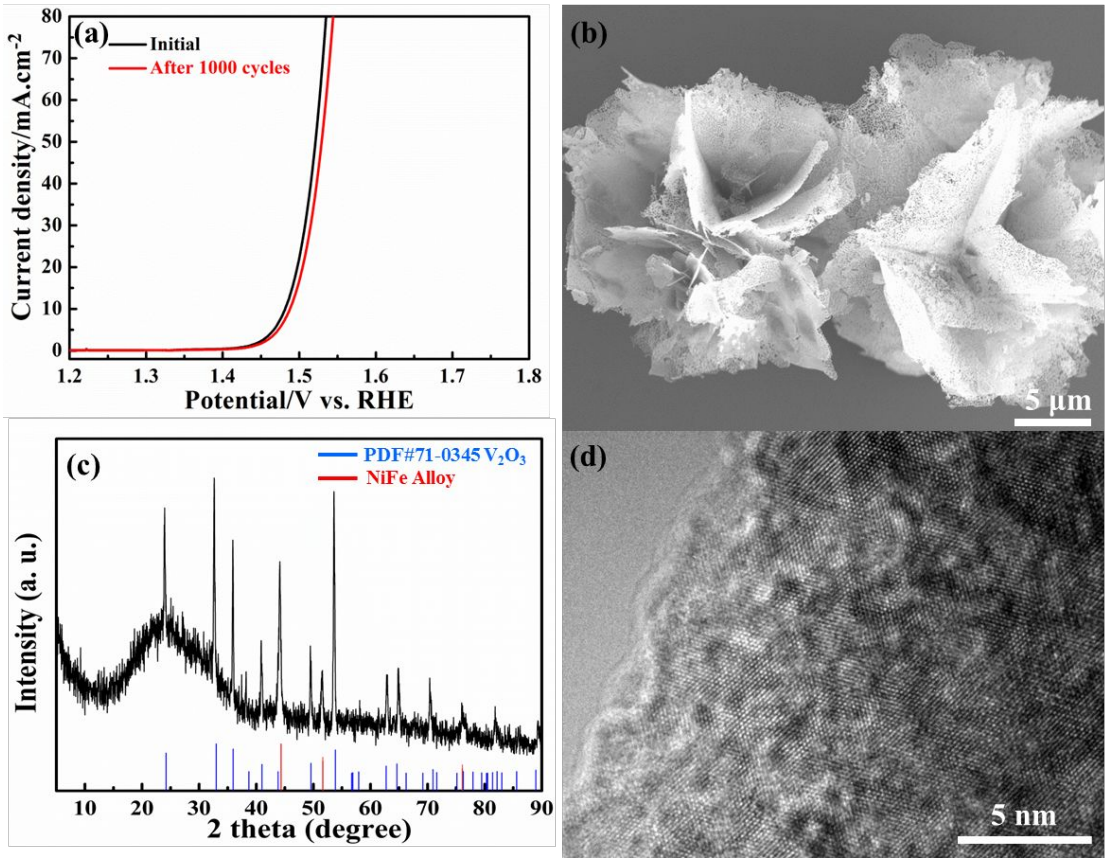

Figure S8 LSV curves of the NiFe@V_2O_3 in 1M KOH after 1000 cycles (a); SEM image (b), XRD pattern (c), and HRTEM image (d) of NiFe@V_2O_3 after long-term test in 1.0 M KOH.

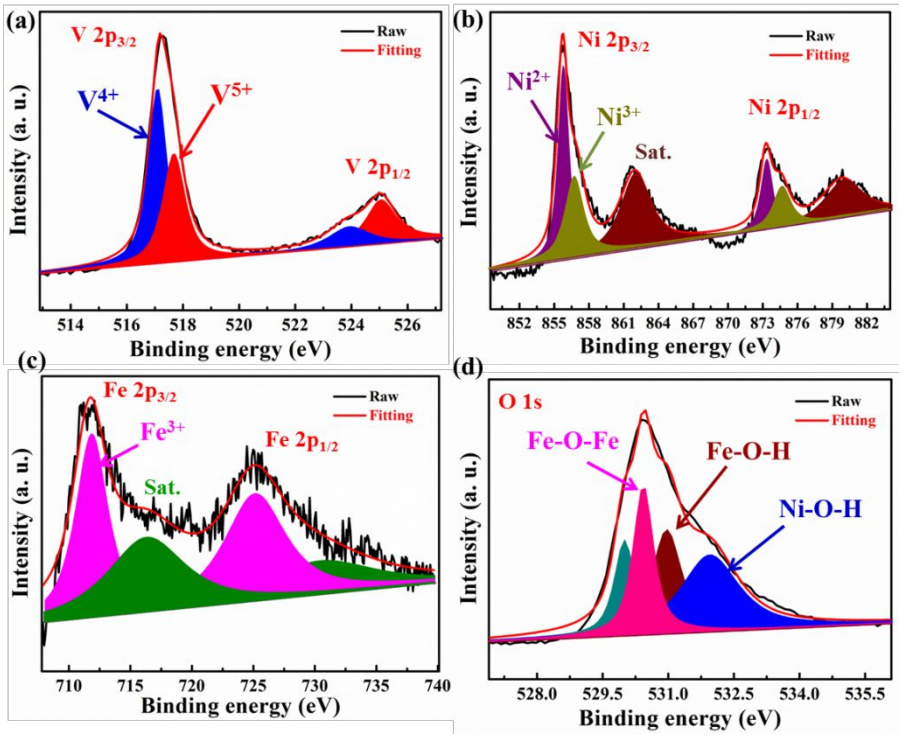

Figure S9 (a) High-resolution XPS spectra of (a) V 2p, (b) Ni 2p, (c) Fe 2p, and (d) O 1s for the NiFe@V_2O_3 hybrid after long-term durability test in alkaline medium.

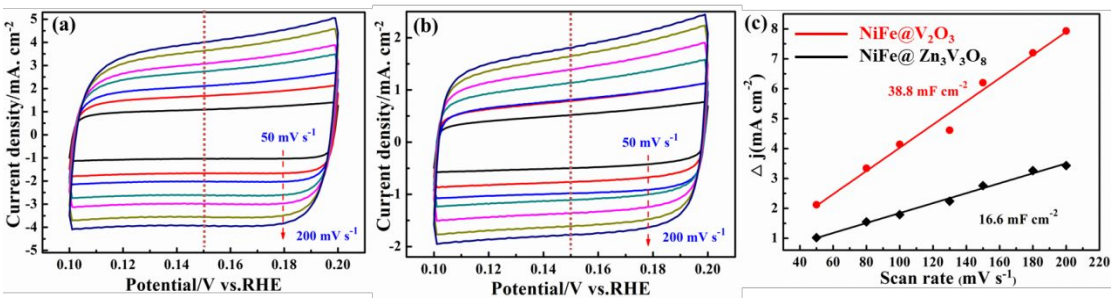

Figure S10 Typical cyclic voltammetry curves of NiFe@V_2O_3 (a), and NiFe@$Zn_3V_3O_8$ (b) with different scan rates; (c) capacitive current based on scan rate of NiFe@V_2O_3, and NiFe@$Zn_3V_3O_8$ at the overpotential of 0.15V.

Table S1 Comparison of the electrocatalytic performance of the NiFe@V_2O_3 to other recently reported high performance OER catalysts.

Electrocatalyst	**Electrolyte**	**Tafel slope (mV dec^{-1})**	**η (mV) at 10 mA cm^{-2}**	**Reference**
NiFe@V_2O_3	1 M KOH	51	255	This work
NiFe–MoO_x NS	1 M KOH	55	370	1
FeCoNi alloy	1 M KOH	55	325	2
NiFe/C Hybrids	1 M KOH	54	330	3
Ni_3Se_2/CF	1 M KOH	80	295	4
NiCo binary oxide	1 M KOH	39	325	5
Co-P	1 M KOH	65	300	6
P,S-CNS	0.1 M KOH	64	330	7
EG/CoSe-NiFe-LDH	1 M KOH	57	250	8

Table S2 Comparison of the electrocatalytic performance of the NiFe@V_2O_3 to other recently reported high performance HER catalysts.

Electrocatalyst	**Electrolyte**	**Tafel slope (mV dec^{-1})**	**η (mV) at -10 mA cm^{-2}**	**Reference**
NiFe@V_2O_3	1 M KOH	85.4	84	This work
FeCoNi alloy	1 M KOH	77	211	[2]
NiFe/C Hybrids	1 M KOH	111	219	[3]
Ni_3Fe/N-C sheets	1 M KOH	98	72	[9]
$NiSe_2$ NCs	1 M KOH	139	540	[10]
$Co(S_{0.71}Se_{0.29})_2$	1 M KOH	86	122	[11]
CoP/CC	1 M KOH	209	129	[12]
$Co_{0.5}Mn_{1.5}CH$	1 M KOH	/	180	[13]
NiSe/NF	1 M KOH	120	96	[4]

References

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