Supporting Information

Two-dimension on two-dimension: Hierarchical $Ni_{0.2}Mo_{0.8}N$ /Fe-doped Ni_3N nanosheets arrays as multifunctional electrocatalysts for overall water splitting

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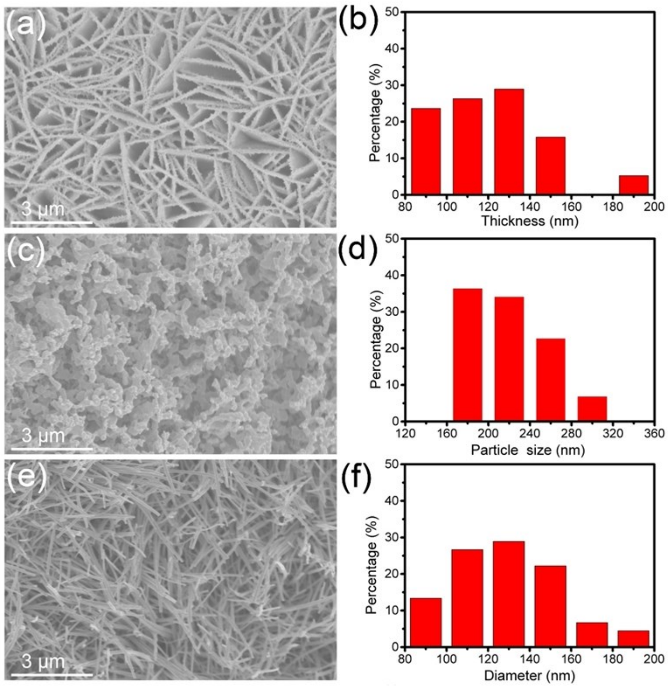

Figure S1. (a) SEM image of Fe-Ni$(OH)_2$/NF, (b) the nanosheet thickness distribution of Fe-Ni$(OH)_2$/NF, (c) SEM image of Fe-Ni_3N/NF, (d) the particle size distribution of Fe-Ni_3N/NF, (e) SEM image of $Ni_{0.2}Mo_{0.8}N$/NF. (f) the nanowire diameter of distribution of $Ni_{0.2}Mo_{0.8}N$/NF.

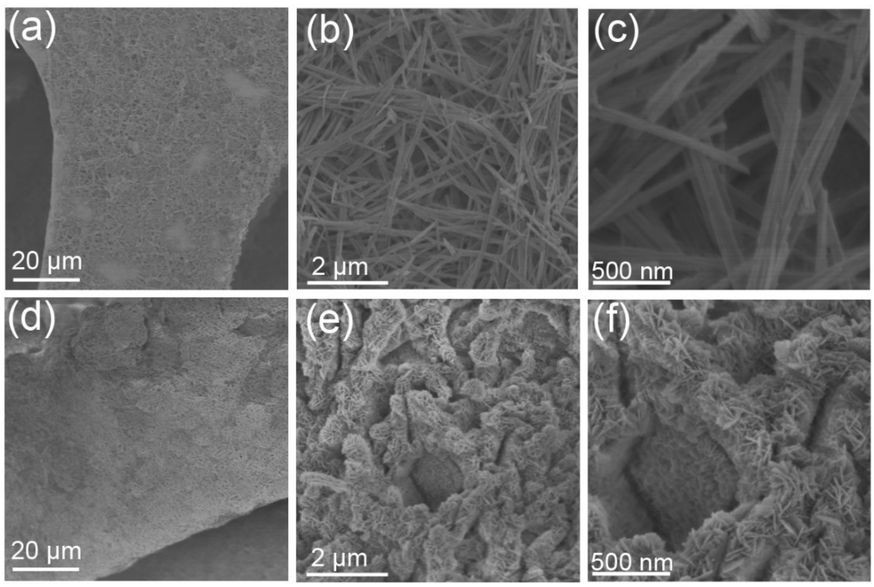

Figure S2. FE-SEM images of (a-c) $NiMoO_4$/NF, (d-f) $NiMoO_4$/Fe-Ni$(OH)_2$/NF.

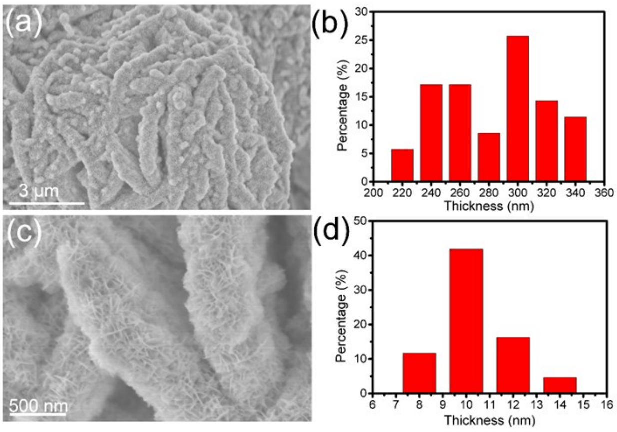

Figure S3 (a) SEM image of $Ni_{0.2}Mo_{0.8}N$/ Fe-Ni_3N /NF, (b) the nanosheet thickness distribution of $Ni_{0.2}Mo_{0.8}N$/ Fe-Ni_3N/NF, (c) High resolution SEM image of Fe-Ni_3N/NF, (d) the small nanosheet thickness distribution of $Ni_{0.2}Mo_{0.8}N$/ Fe-Ni_3N/NF.

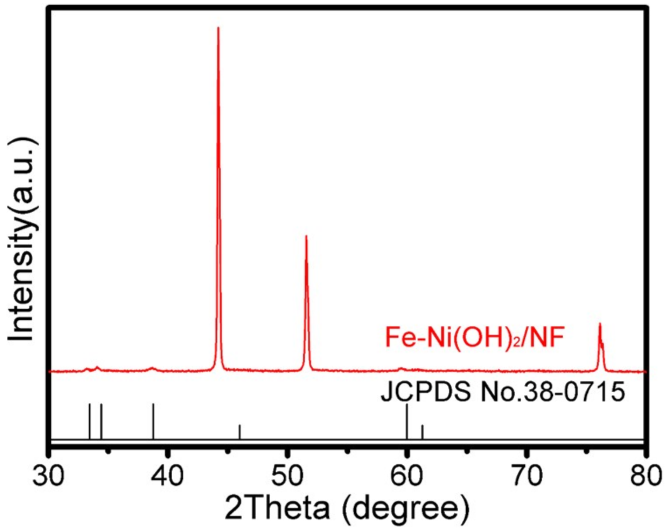

Figure S4. XRD pattern of Fe-$Ni(OH)_2$/NF.

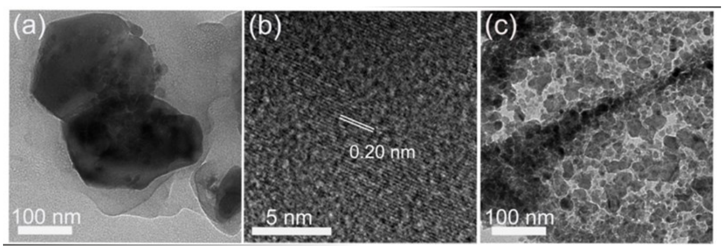

Figure S5. (a) TEM image of Fe-Ni_3N/NF, (b) HRTEM image of Fe-Ni_3N/NF (c) TEM image of $Ni_{0.2}Mo_{0.8}N$/Fe-Ni_3N/NF.

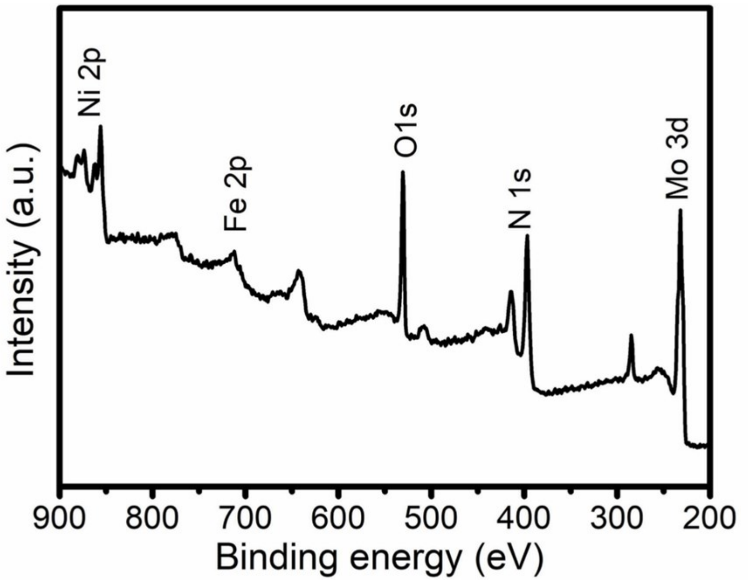

Figure S6. XPS survey of $Ni_{0.2}Mo_{0.8}N$/Fe-Ni_3N/NF.

Table S1. Comparison of OER performance of $Ni_{0.2}Mo_{0.8}N$/Fe-Ni_3N/NF with other non-noble metal OER electrocatalysts in alkaline conditions.

Electrocatalyst	Electrolyte	Overpotential (mV)	Reference
Ni_3N@NC-24	1.0 M KOH	260 (10 mA·cm^{-2})	ACS Appl. Energy Mater. 2018, 1, 6774–6780.
O-Co_3S_4@S-MCN	1.0 M KOH	370 (10 mA·cm^{-2})	Cryst. Growth Des. 2020, 20, 6321–6328.
Co-Ni_3N	1.0 M KOH	270 (10 mA·cm^{-2})	J. Phys. Chem. Lett. 2021, 12, 1581-1587.
Cu_3N/NF	1.0 M KOH	286 (10 mA·cm^{-2})	ACS Energy Lett. 2019, 4, 747-754
B-Ni_N_2_10 min	1.0 M KOH	350 (10 mA·cm^{-2})	ACS Appl. Nano Mater. 2020, 3, 10986-10995.
$Co_{1.9}Ni_{0.1}(CO_3)(OH)_2$/GP	1.0 M KOH	266 (10 mA·cm^{-2})	ACS Appl. Energy Mater. 2020, 3, 7335-7344
$CuNCo_{2.4}V_{0.6}$	1.0 M KOH	232 (10 mA·cm^{-2})	Nano Lett. 2019, 19, 7457-7463
BGO/Ni_3N	1.0 M KOH	290 (10 mA·cm^{-2})	Nano Mater. 2020, 3, 9924-9930.
CoNiMoN-400 NRs	1.0 M KOH	294 (10 mA·cm^{-2})	ACS Appl. Mater. Interfaces 2019, 11, 27751-27759
$Co_{3.2}Fe_{0.8}N$	0.1 M KOH	419 (10 mA·cm^{-2})	ACS Appl. Nano Mater. 2019, 2, 5931-5941
Co_4N@NC-700[	1.0 M KOH	257 (10 mA·cm^{-2})	ACS Energy Lett. 2020, 5, 692-700
$Ni_{0.2}Mo_{0.8}N$/Fe-Ni_3N/NF	1.0 M KOH	266 (20 mA·cm^{-2})	This work

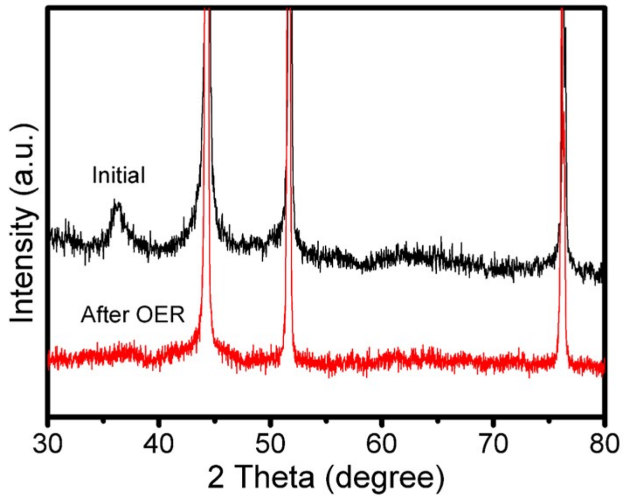

Figure S7. XRD pattern of $Ni_{0.2}Mo_{0.8}N/Fe\text{-}Ni_3N/NF$ before and after OER for 50 h.

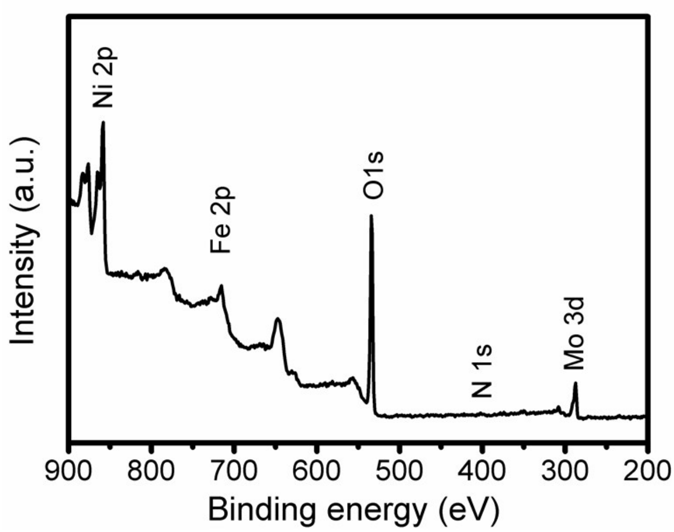

Figure S8. XPS survey of $Ni_{0.2}Mo_{0.8}N/Fe\text{-}Ni_3N/NF$ after OER for 50 h.

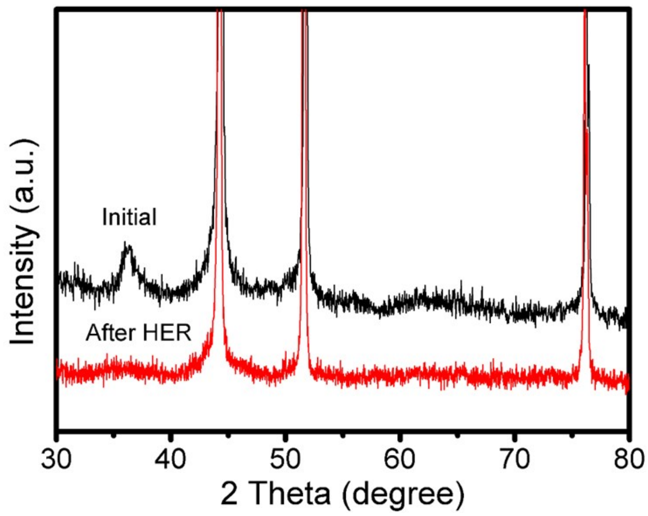

Figure S9. XRD pattern of $Ni_{0.2}Mo_{0.8}N/Fe\text{-}Ni_3N/NF$ after HER for 50 h.

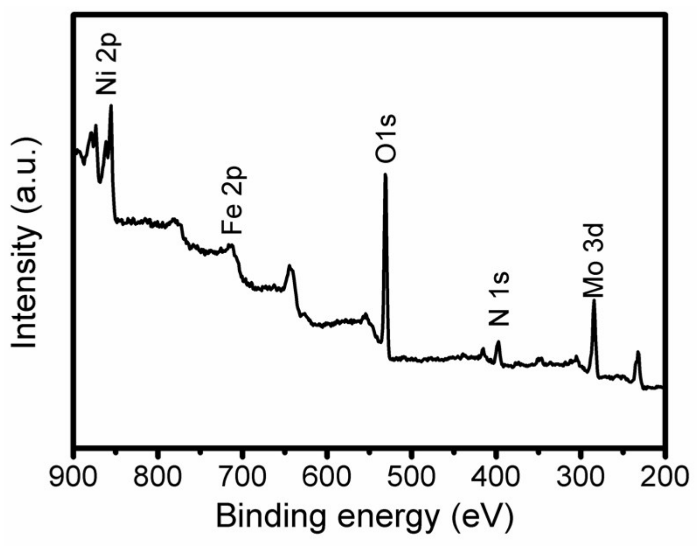

Figure S 10. XPS survey of $Ni_{0.2}Mo_{0.8}N/Fe-Ni_3N/NF$ after HER for 50 h.

Table S2. Comparison of HER performance of $Ni_{0.2}Mo_{0.8}N/Fe-Ni_3N/NF$ with other non-noble metal OER electrocatalysts in alkaline conditions.

Electrocatalyst	Electrolyte	Overpotential (mV)	Reference
Co_3Mo_1S-CC	1.0 M KOH	85 (10 mA·cm^{-2})	ACS Appl. Mater. Interfaces 2020, 12, 40194-40203
c-MoS_2-C	1.0 M KOH	93 (10 mA·cm^{-2})	Nano Lett. 2021, 21, 1848-1855
$Mo_2N–Co_xN$-5	1.0 M KOH	29 (10 mA·cm^{-2})	J. Mater. Chem. A, 2021, 9, 8620–8629
$NiP_2/NiSe_2$	1.0 M KOH	93 (10 mA·cm^{-2})	*Appl. Catal. B Environ.,* **2021**, 282, 119584
CoMoNx-500 NSAs/NF	1.0 M KOH	200 (10 mA·cm^{-2})	ACS Appl. Mater. Interfaces 2020, 12, 29253-29263
Ni_3N/NF	1.0 M KOH	44 (10 mA·cm^{-2})	ACS Appl. Mater. Interfaces 2020, 12, 5951-5957
Co2Ni1N	1.0 M KOH	102.6 (10 mA·cm^{-2})	ACS Appl. Mater. Interfaces 2019, 11, 8018-8024
C-350	1.0 M KOH	47 (10 mA·cm^{-2})	ACS Sustainable Chem. Eng. 2020, 8, 7414-7422
Co-Ni_3N	1.0 M KOH	30 (10 mA·cm^{-2})	J. Phys. Chem. Lett. 2021, 12, 1581-1587.
NiMoN@NiFeN	1.0 M KOH	84 (10 mA·cm^{-2})	Nat.Commun., 2019, 10, 1-10.
$Ni_{0.2}Mo_{0.8}N/Fe-Ni_3N/NF$	1.0 M KOH	266 (20 mA·cm^{-2})	This work

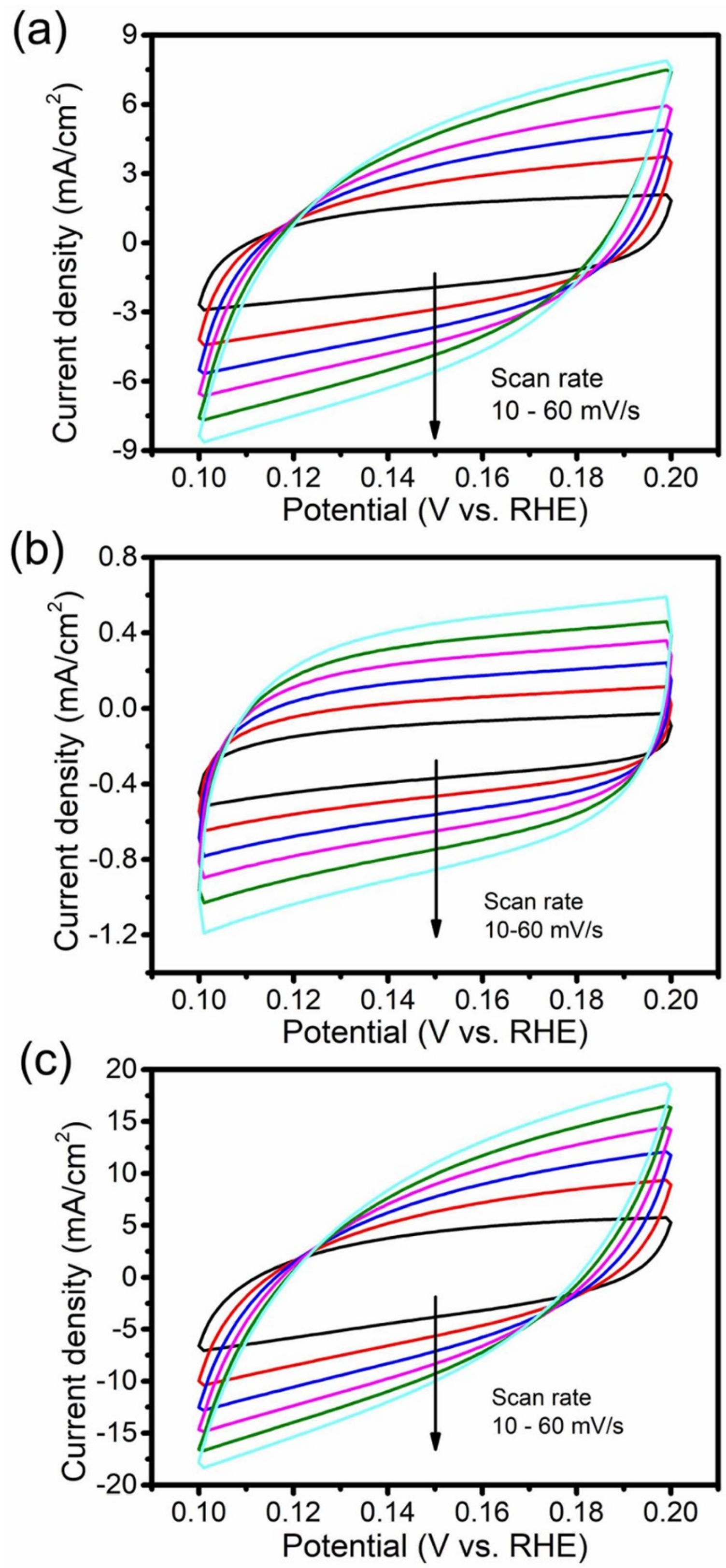

Figure S11. CV curves of (a) $Ni_{0.2}Mo_{0.8}N$/NF., (b)Fe-Ni_3N/NF and (c) $Ni_{0.2}Mo_{0.8}N$/Fe-Ni_3N/NF.