Supporting information

Nanoscale Nickel-Iron Nitrides-Derived Efficient Electrochemical Oxygen Evolution Catalysts

Jianmin Wang[1+], Feng Cao[1*+], Chen Shen[1], Guoqing Li[2]*, Xin Li[1], Xi Yang[1], Song Li[1*], Gaowu Qin[1]

[1]Key Lab for Anisotropy and Texture of Materials (MoE), School of Materials Science and Engineering, Northeastern University, Shenyang 110819, China

[2]Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC 27695

* To whom correspondence should be addressed.
Emails: caof@atm.neu.edu.cn; gli4@ncsu.edu; lis@atm.neu.edu.cn;
[+] J. M. Wang. and F. Cao contributed equally to this work

This file includes:
Fig. S1- S12
Table S1

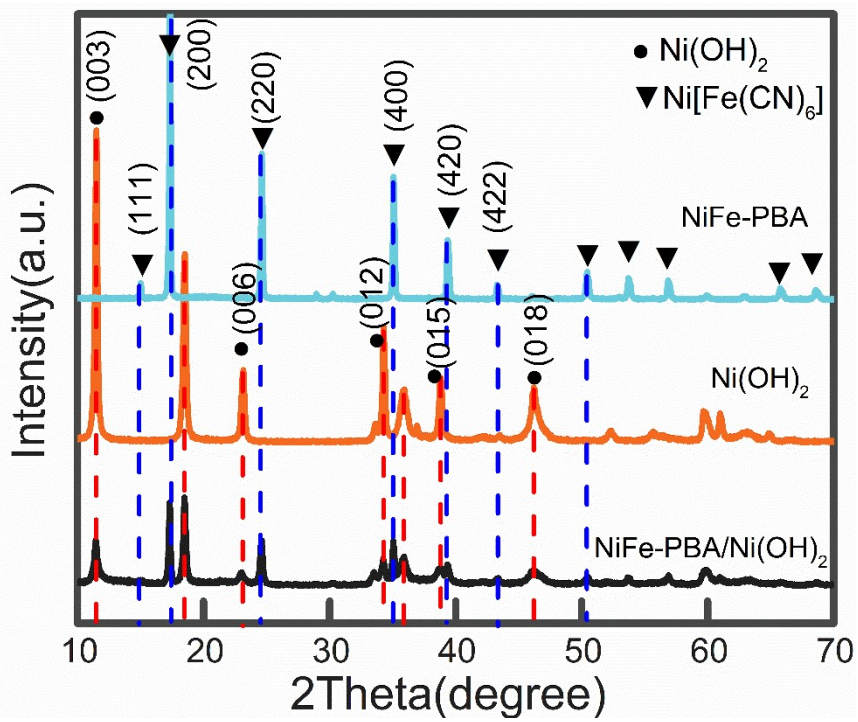

Figure S1. XRD patterns of $Ni(OH)_2$, NiFe-PBA/$Ni(OH)_2$ and NiFe-PBA.

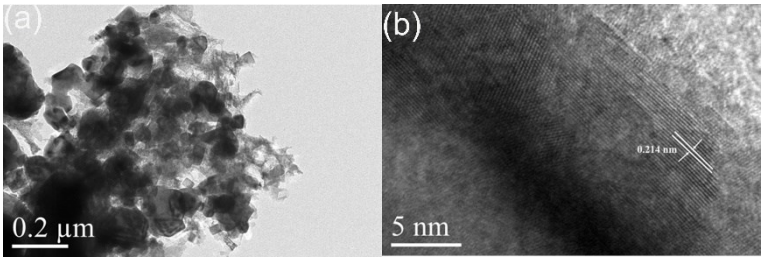

Figure S2. TEM and HRTEM of Ni (OH)2 after NH3 treatment.

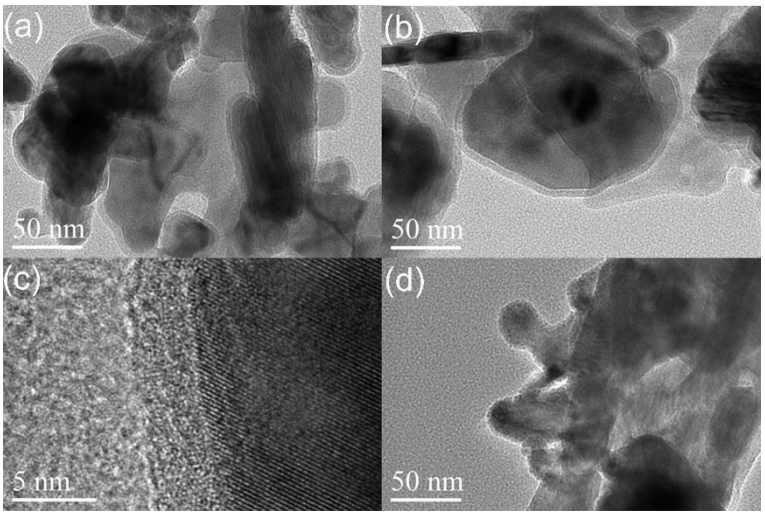

Figure S3. TEM and HRTEM of NiFe-PBA after NH3 treatment.

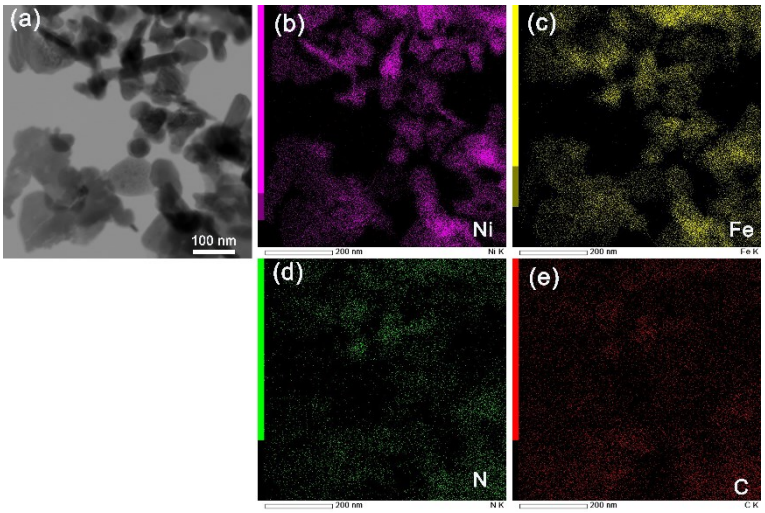

Figure S4. TEM mapping of NiFe-PBA after NH3 treatment.

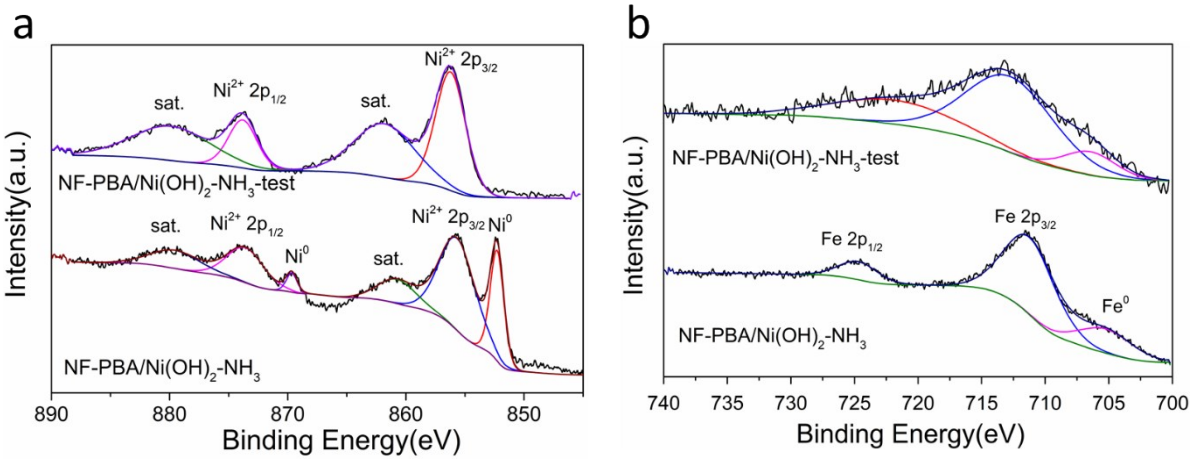

Figure S5. (a) The high resolution XPS peaks of Ni atom before and after electrochemical conversion step. (b) The high resolution XPS peaks of Fe atom before and after electrochemical conversion.

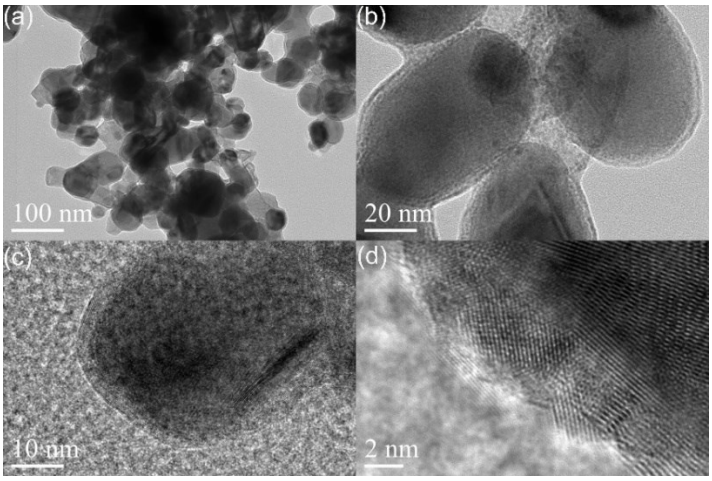

Figure S6. TEM images of samples with different amounts of Fe: 0.5 PBA.

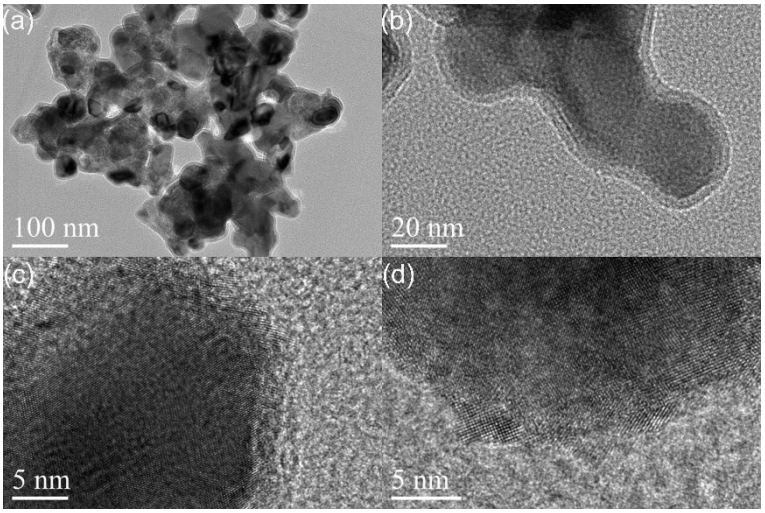

Figure S7. TEM images of samples with different amounts of Fe:1.5 PBA;

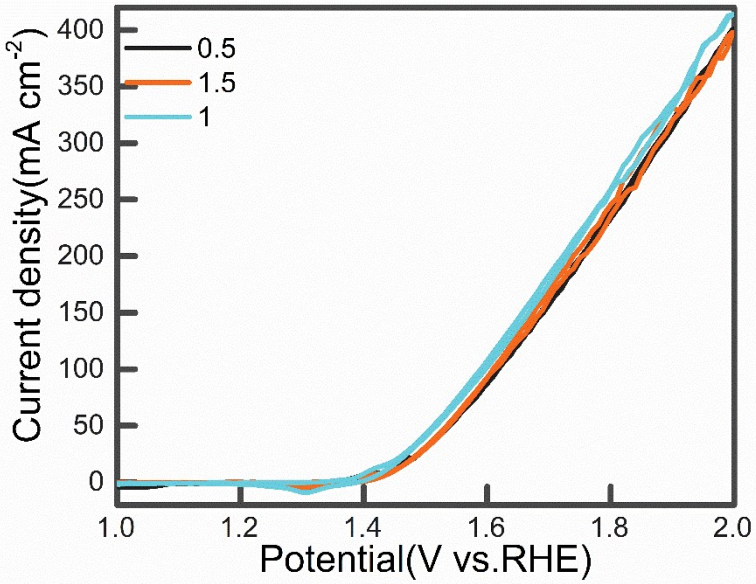

Figure S8. OER activity of the samples with different amounts of Fe.

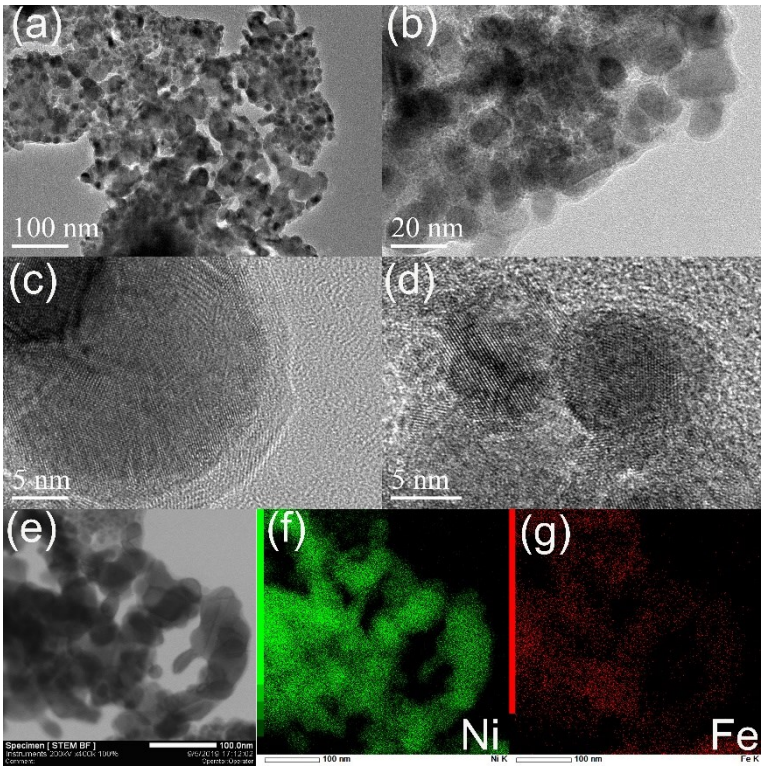

Figure S9. TEM of the sample prepared under H2 atmosphere.

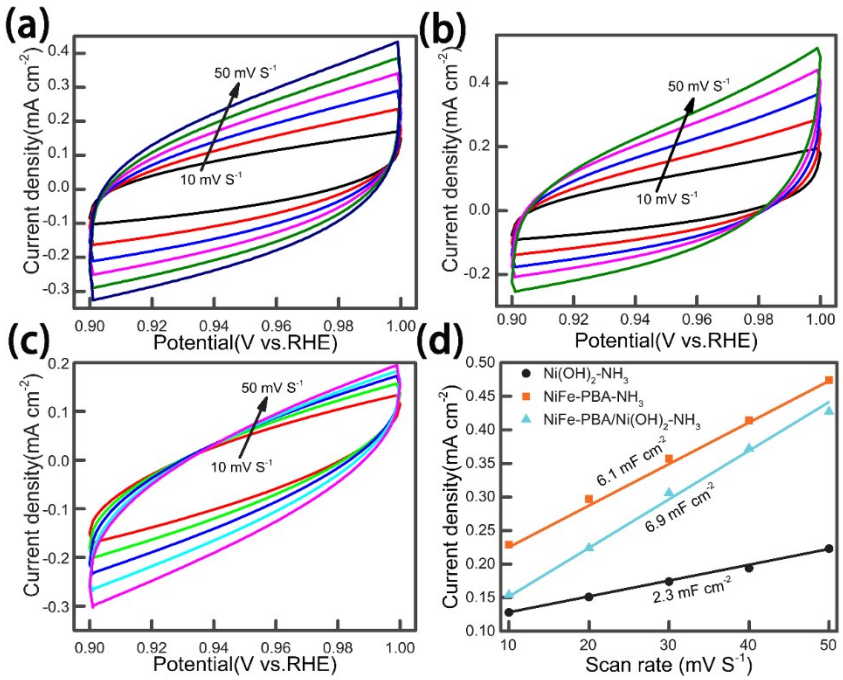

Figure S10. Cyclic voltammogram curves in double layer region at scan rates of 10, 20, 30, 40 and 50 mV S-1 of (a) NiFe-PBA/Ni (OH)2-NH3, (b) NiFe-PBA-NH3, (c) Ni(OH)2-NH3. (d) Estimation of Cdl by plotting the current density difference at 0.96 V vs. RHE.

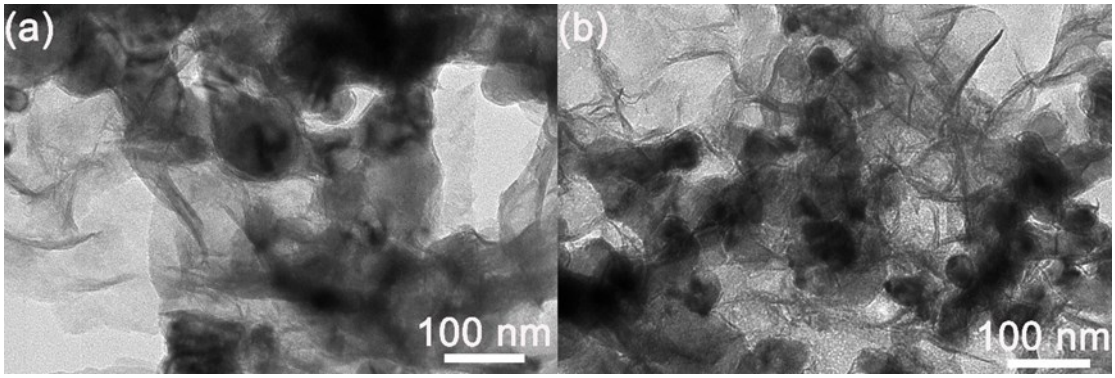

Figure S11. TEM images of the sample (a)after 3 times test and (b)1000 times test.

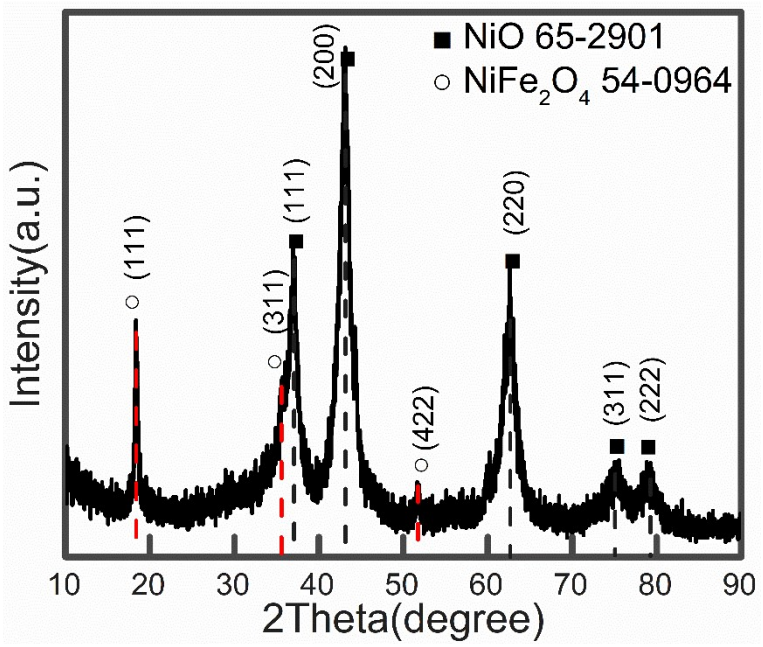

Figure S12. XRD pattern of the sample treated under air.

Table S1 Comparison of OER activity for $NiFe_3N$/Ni and recently reported NiFe-based catalysts.

Catalyst	Overpotential (mV)	Electrolyte	Reference
NiFe3N/Ni	200	1.0 M KOH	This work
Ni3FeN NP	280	1.0 M KOH	[7]
Ni3FeN	355	0.1 M KOH	[8]
Ni3N	400	1.0 M KOH	[6]
Fe3N/Fe4N	238	1.0 M KOH	[9]
Ni foam@Ni-Ni0.2Mo0.8N	218	1.0 M KOH	[10]
Ni Nitrate Hydroxide	210	1.0 M KOH	[11]

Ni-Fe disulfide @oxyhydroxide	230	1.0 M KOH	[12]
Ni2P@NiFe hydroxide	205	1.0 M KOH	[13]
NiFe-LDH	267	1.0 M KOH	[14]
Ni-Fe hydroxides	337	1.0 M KOH	[15]
NiFeOOH	267	1.0 M KOH	[16]