Supporting Information

In situ templating synthesis of mesoporous Ni-Fe electrocatalyst for oxygen evolution reaction

Ya Wang, Jun Yu, Yanding Wang, Zhuwen Chen, Lei Dong, Rongming Cai, Mei Hong*, Xia Long*, Shihe Yang*

State Key Laboratory of Chemical Oncogenomics, Guangdong Provincial Key Laboratory of Nano-Micro Materials Research, School of Chemical Biology & Biotechnology, Peking University Shenzhen Graduate School (PKUSZ), Shenzhen 518055, P.R. China.

*Corresponding author.

E-mail address: hongmei@pku.edu.cn, tel: (+86) 755 26032970, fax (+86) 755 26033174 (M. Hong). xialong@pku.edu.cn. chsyang@pku.edu.cn.

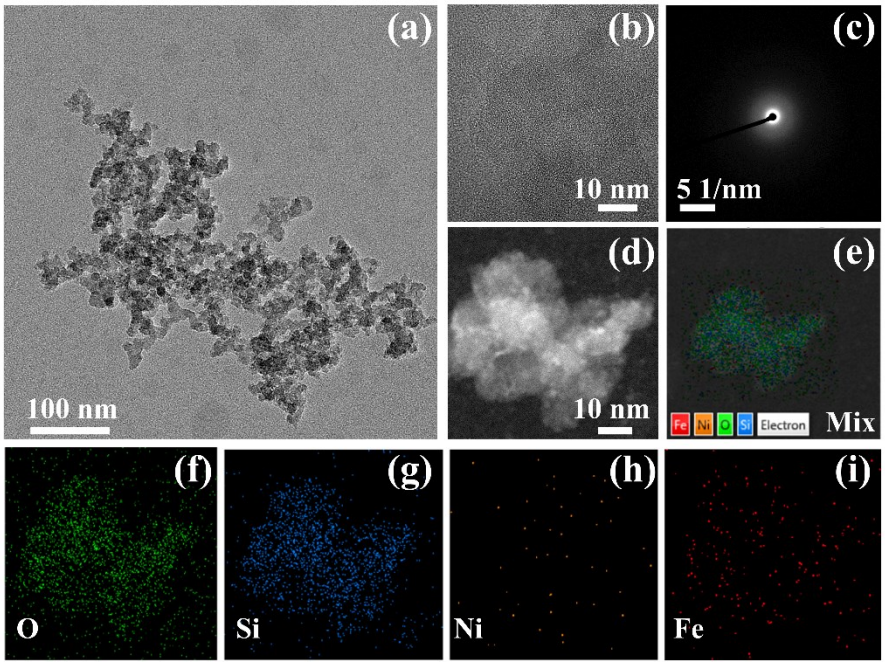

Figure S1. (a) TEM image, (b) HRTEM image, (c) SAED pattern, (d) HAADF-STEM image and (e-i) EDX elemental mapping images of O, Si, Ni, and Fe elements for 1Ni2Fe-MFS.

Table S1. Ni and Fe weight content obtained by ICP-AES analysis for 2Ni1Fe-MFS and 1Ni2Fe-MFS samples.

Sample	Weight content (%)		Ni/Fe
	Ni	Fe	
2Ni1Fe-MFS	1.01	0.94	1.07
1Ni2Fe-MFS	0.50	1.67	0.30

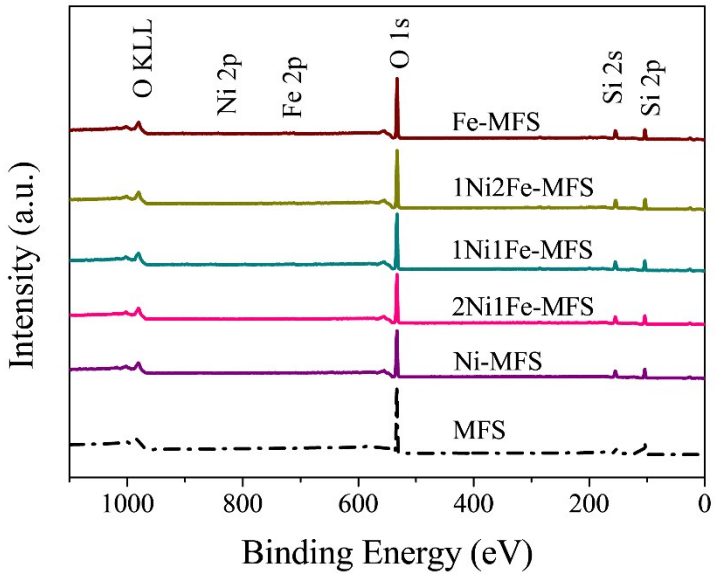

Figure S2. XPS survey spectra of MFS and various NiFe-MFS samples.

Table S2. Experimental atomic compositions and Ni/Fe, Si/O ratio obtained by XPS analysis for MFS and various NiFe-MFS samples.

Sample	Atomic content (%)				Ni/Fe	Si/O
	Si	O	Ni	Fe		
MFS	32.99	67.01	-	-	-	0.492
Ni-MFS	33.40	66.00	0.59	-	-	0.506
Fe-MFS	32.19	66.50	-	1.30	-	0.489
2Ni1Fe-MFS	32.26	66.00	0.69	1.05	0.66	0.489
1Ni1Fe-MFS	32.34	66.15	0.54	0.98	0.55	0.486
1Ni2Fe-MFS	32.19	66.25	0.44	1.11	0.40	0.484

Table S3. Comparison of Ni and Fe weight content obtained from ICP and XPS analysis for 2Ni1Fe-MFS and 1Ni2Fe-MFS.

Sample		Weight content (%)		Ni/Fe
		Ni	Fe	
ICP	2Ni1Fe-MFS	1.01	0.94	1.07
	1Ni2Fe-MFS	0.50	1.67	0.30
XPS	2Ni1Fe-MFS	1.96	2.84	0.69
	1Ni2Fe-MFS	1.26	3.02	0.42

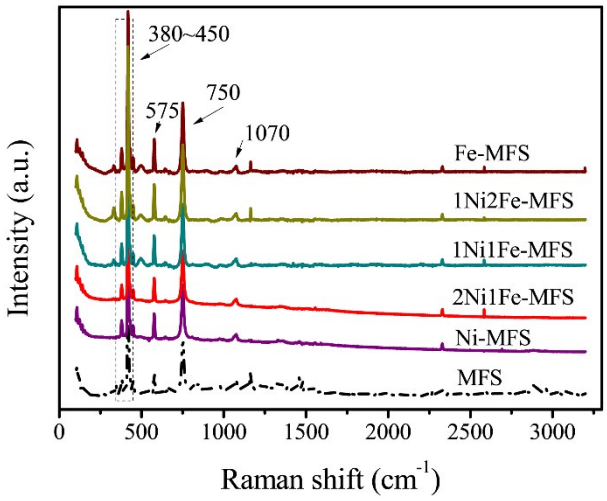

Figure S3. Raman spectra of MFS and various NiFe-MFS samples.

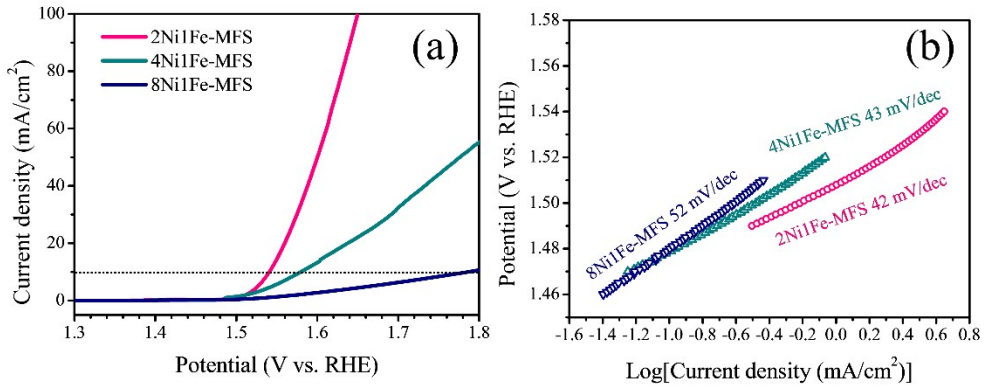

Figure S4. (a) 95% *iR*-compensated polarization curves, (b) Tafel plots of 4Ni1Fe-MFS and 8Ni1Fe-MFS modified carbon cloth electrodes.

Table S4. Ni and Fe weight content obtained from ICP-AES for 4Ni1Fe-MFS and 8Ni1Fe-MFS.

Sample	Weight content (%)		Ni/Fe
	Ni	Fe	
4Ni1Fe-MFS	0.70	0.46	1.51
8Ni1Fe-MFS	0.80	0.38	2.11

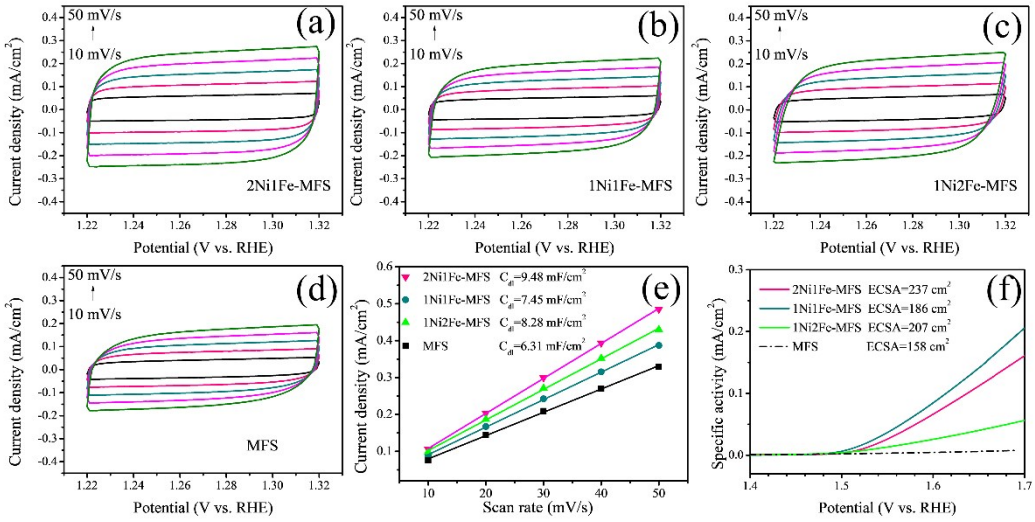

Figure S5. Cyclic voltammograms recorded at different scan rates for (a) 2Ni1Fe-MFS, (b) 1Ni1Fe-MFS, (c) 1Ni2Fe-MFS and (d) MFS. (e) Scan rate dependence of the current densities, (f) the specific activity for OER normalized by ECSA of various catalysts modified carbon cloth electrodes.

Table S5. TOF values for 2Ni1Fe-MFS, IrO_2 and RuO_2 electrocatalysts.

Sample	TOF (s^{-1})
2Ni1Fe-MFS	0.1550
IrO_2	0.0019
RuO_2	0.0008

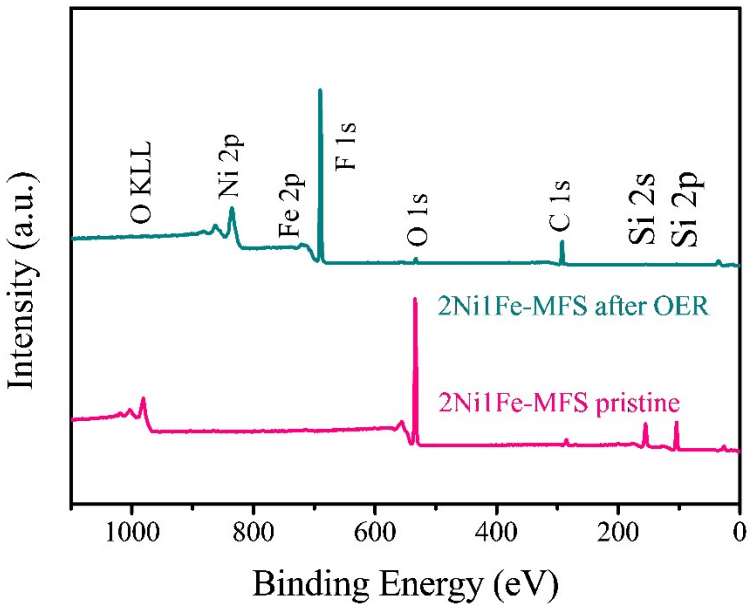

Figure S6. (a) XPS survey spectra of 2Ni1Fe-MFS pristine and after OER

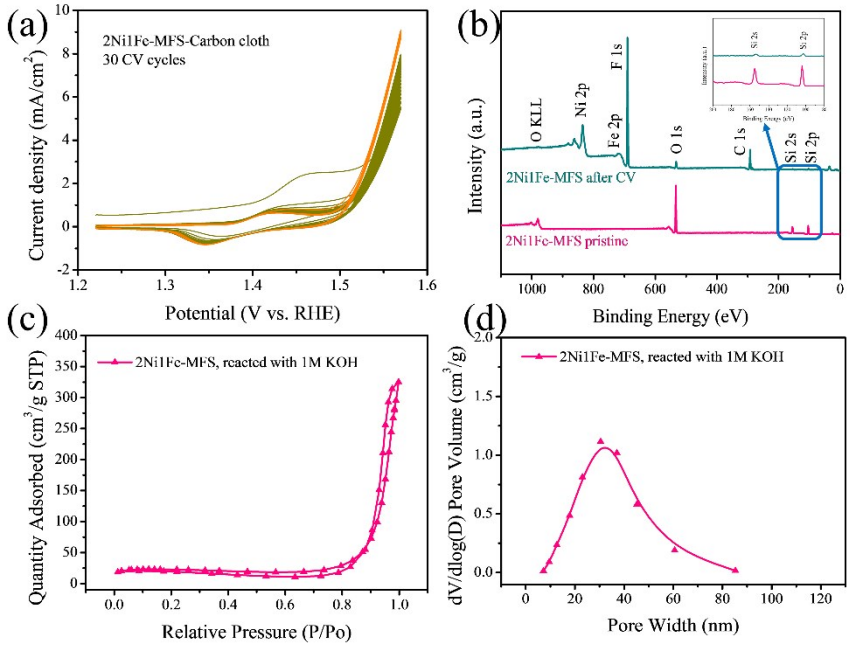

Figure S7. (a) Cyclic voltammograms (CV), the dark yellow lines represent 0~20 CV cycles, and the orange lines represent 20~30 CV cycles, (b) XPS survey spectra of 2Ni1Fe-MFS pristine and after 30 cycles CV, (c) N_2 adsorption-desorption isotherms, (d) BJH pore size distribution curves of 2Ni1Fe-MFS after reacted with 1 M KOH.

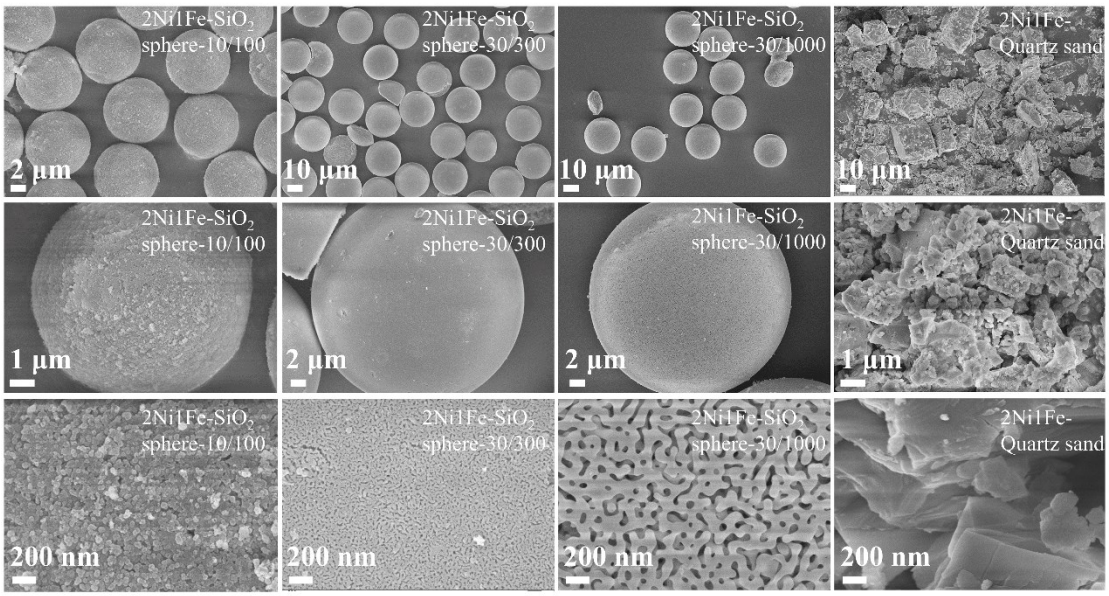

Figure S8. SEM images of 2Ni1Fe-SiO_2 sphere-10/100, 2Ni1Fe-SiO_2 sphere-30/300, 2Ni1Fe-SiO_2 sphere-30/1000 and 2Ni1Fe-quartz sand.

Table S6. BET surface area and pore volume of MFS and NiFe-MFS.

Sample	BET surface area/ m^2 g^{-1}	Pore volume/ m^3 g^{-1}		
		V_{micro} [1]	V_{meso}	V_{total} [2]
2Ni1Fe-MFS	283	0.01	0.98	0.99
2Ni1Fe-SiO_2 sphere-10/100	253	0.02	0.67	0.69
2Ni1Fe-SiO_2 sphere-30/300	67	0.01	0.22	0.23
2Ni1Fe-SiO_2 sphere-30/1000	16	0.00	0.02	0.02
2Ni1Fe-Quartz sand	23	0.00	0.03	0.03

Notes: [1] t-Plot micropore volume. [2] Total pore volume calculated as the amount of N_2 adsorbed at P/Po = 0.98.

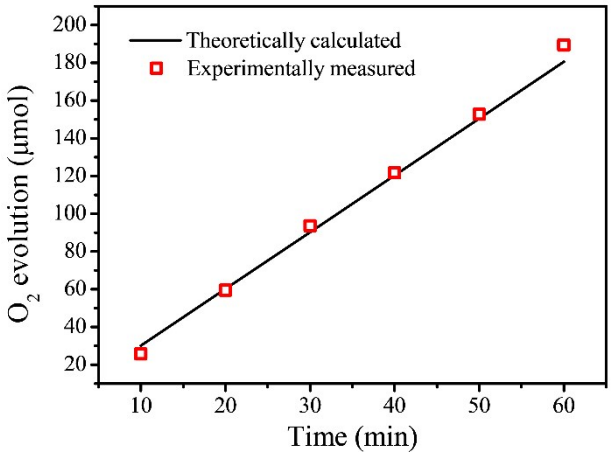

Figure S9. The amount of O_2 theoretically calculated (solid curve) and experimentally measured (scatter symbol) versus time for 2Ni1Fe-MFS in 1 M KOH at 20 mA for 60 min.