Electronic Supplementary Information

MultimetallicNi-Mo/Cunanowires as nonprecious and efficient full water splitting catalyst

Shunan Zhao,‡[a] Jianfei Huang,‡[b] Yanyan Liu,[a] Jianhua Shen,[a] Hao Wang,[a] Xiaoling Yang,[a] Yihua Zhu,[a] and Chunzhong Li*[a]*

[a] Key Laboratory for Ultrafine Materials of Ministry of Education, School of Materials Science and Engineering, East China University of Science and Technology,Shanghai200237, China. E-mail: yhzhu@ecust.edu.cn, czli@ecust.edu.cn

[b] Department of Chemistry and Biochemistry, University of California, Santa Barbara, Santa Barbara 93106, CA, USA

‡ These authors contributed equally.

* Author Correspondence: Y.H. Zhu, yhzhu@ecust.edu.cn; C.Z. Li, czli@ecust.edu.cn

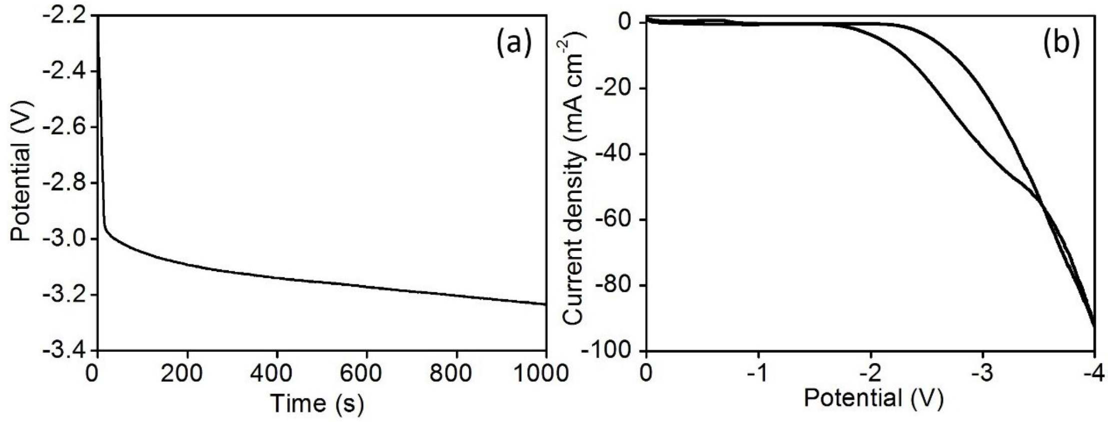

Figure S1. (a) Chronopotentiometric curve and (b) Cyclic voltammetry of Ni-Mo Electrodeposition.

As can be seen from the potential-time curve, only one potential plateau was found. In the CV profile, also only one broad peak was identified at around -3 V. Data from the two electrochemical characterization methods agree well with each other. This indicates under the constant-current electrodeposition condition, the potential was held at more negative potential than that of the only found reduction peak in Figure S1b, leading to simultaneous deposition of Ni and Mo.

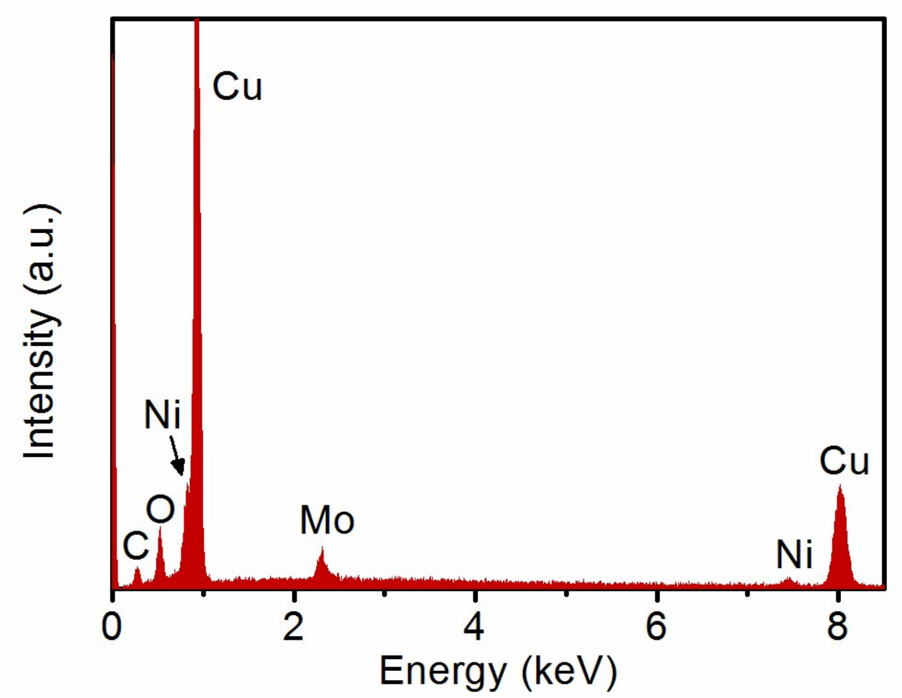

Figure S2. The EDS pattern of the as-preparedNM-CNW.

Table S1. Atomic percentage of Cu, Ni and Mo in NM-CNW sample (substrate included.)

Element	**Cu**	**Ni**	**Mo**
Atomic Percent	97.73%	1.83%	0.44%

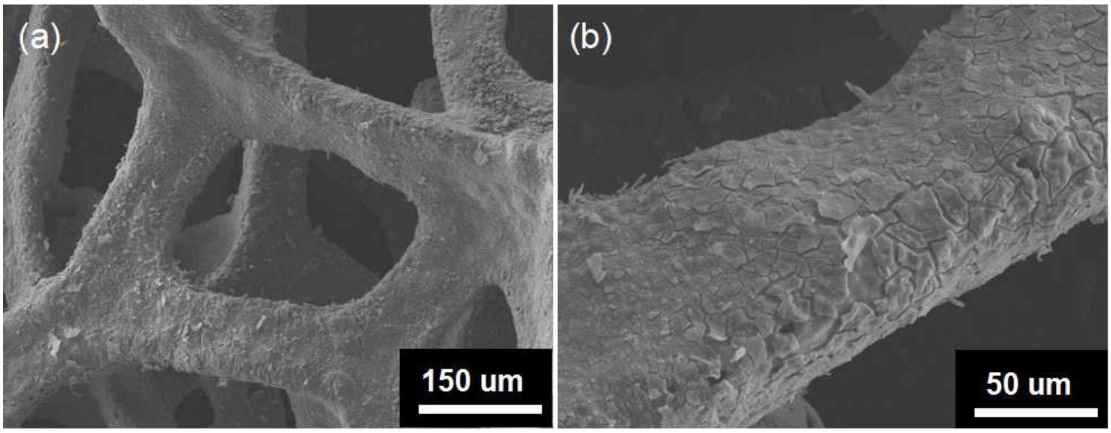

Figure S3. (a) (b) SEM images of NM-CF with different magnifications.

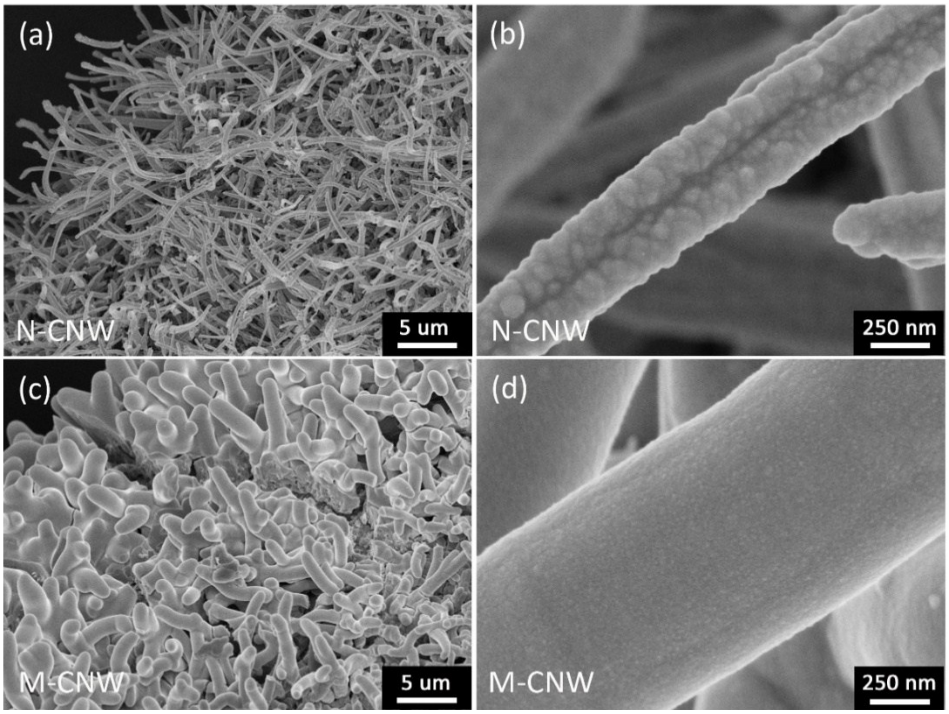

Figure S4. SEM images of (a-b) N-CNW and (c-d) M-CNW.

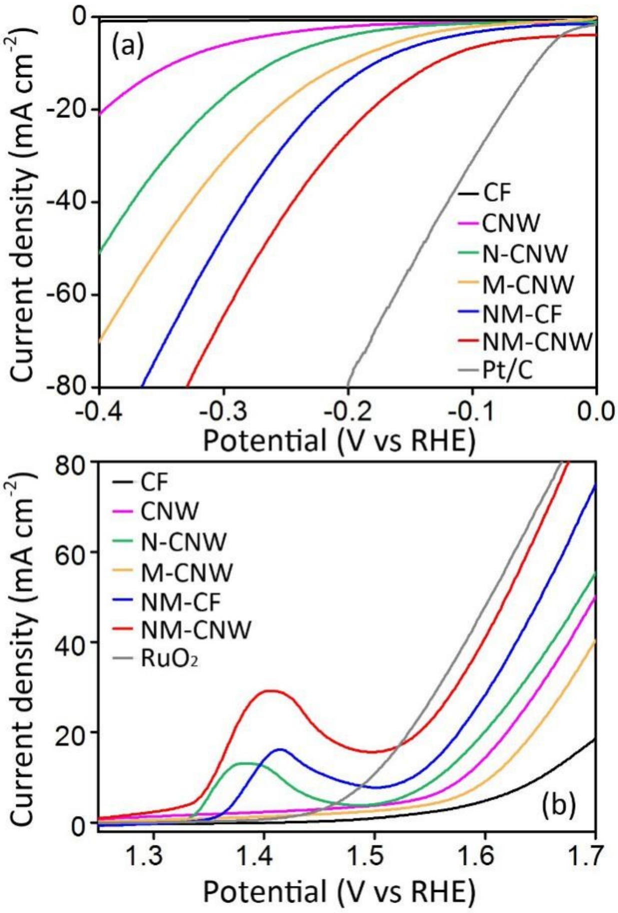

Figure S5. Polarization curves of the samples for (a) HER and (b) OER without iR compensation.

Table S2. Comparison of HER activity from different catalysts

Catalyst	Electrolyte	Tafel Slope (mV/dec)	η @ 10 mA cm^{-2} (mV)	Reference
NiMo-NGTs	0.5 M H_2SO_4	67	65	S1
Ni-Mn_3O_4/NF	1.0 M KOH	110	91	S2
$NiCo_2S_4$ NW/NF	1.0 M KOH	58.9	210	S3
MoC-Mo_2C	1.0 M KOH	42	120	S4
Co-Ni-B	1.0 M KOH	51	133	S5
Fe-CoP/Ti NA	1.0 M KOH	75	78	S6
MoP_2 NPs/Mo	1.0 M KOH	80	194	S7
Ni_3S_2/NF	1.0 M KOH	110	123	S8
$NiSe_2$/Ni hybridfoam	0.5 M H_2SO_4	49	143	S9
Ni_2P	0.5 M H_2SO_4	75	~130	S10
NM-CNW	1.0 M KOH	107	115	this work

Table S3. Comparison of OER activity from different catalysts

Catalyst	Electrolyte	Tafel Slope (mV/dec)	η @20 mA cm^{-2} (mV)	Reference
Core-Shell Ni-Co NW	1.0 M KOH	43.6	~315	S11
$NiCo_2S_4$ NW/NF	1.0 M KOH	40.1	~305	S3
Ni-Co PBA cubes	1.0 M NaOH	50	~395	S12
MoS_2/NF	1.0 M NaOH	105	310	S13
Porous MoO_2	1.0 M KOH	54	280	S14
MoO_2-CoO	1.0 M KOH	57.82	~290	S15
$CoMoO_4$ porous flowers	1.0 M KOH	56	~340	S16
NiFe-MMO/CNT	1.0 M KOH	45	~240	S17
CoP_3 NAs/CFP	1.0 M KOH	81	~350	S18
NF@NC-$CoFe_2O_4$/CNRAs	1.0 M KOH	45	~255	S19
NM-CNW	1.0 M KOH	66	280	this work

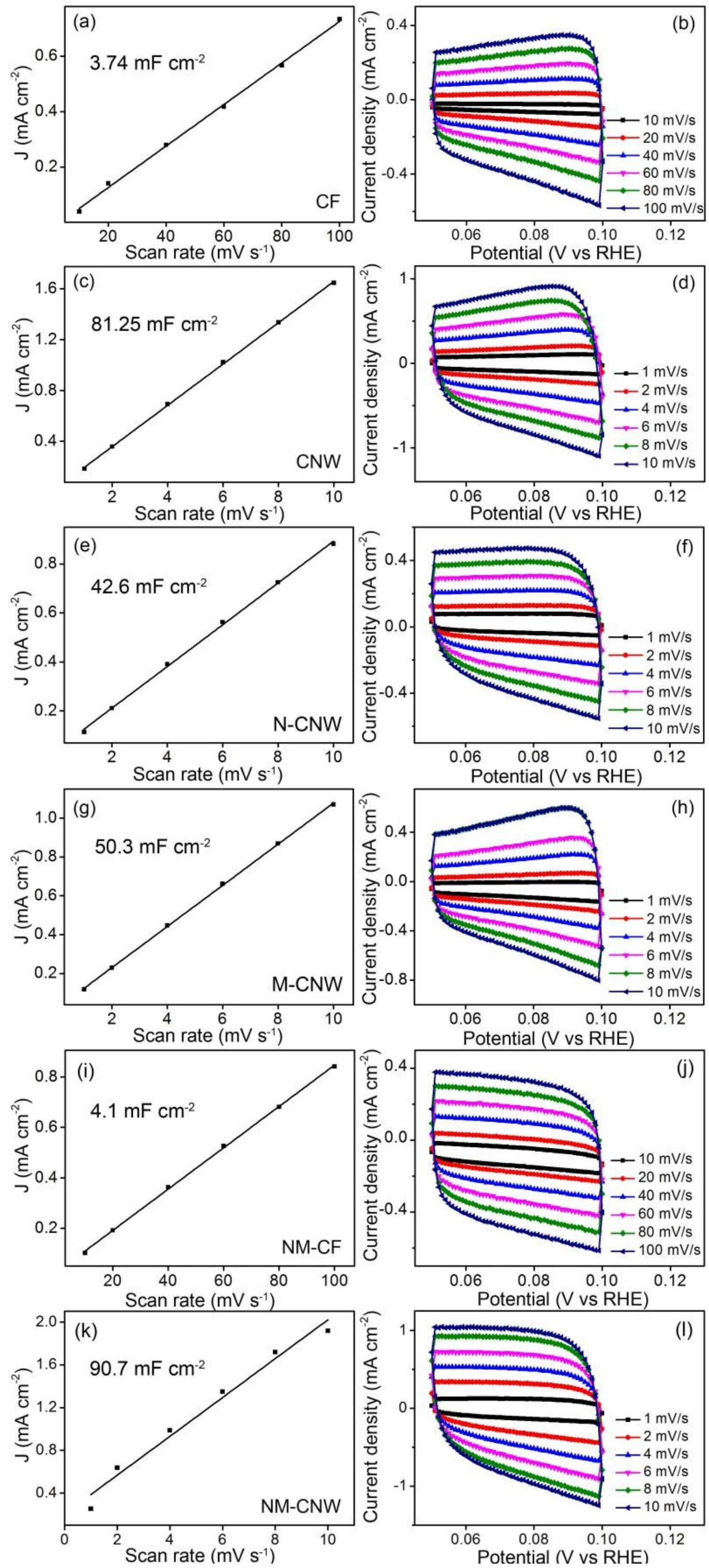

Figure S6. The electrochemical double-layer capacitance calculation CV curves measured at different scan rates and corresponding scan rates plots of the (a-b) CF, (c-d) CNW, (e-f) N-CNW, (g-h) M-CNW, (i-j)NM-CF and (k-l) NM-CNW.

The electrochemical double-layer capacitance calculation[S14]

The electrochemically active surface area was estimated from the electrochemical double-layer capacitance. The electrochemical capacitance (C) was obtainedfrom the cyclic voltammetry measured in a non-Faradaic region at different scan rates (v). The calculated value of C is based on the formula:$C=dQ/dV=i/v$ (i isdouble-layercurrent density).

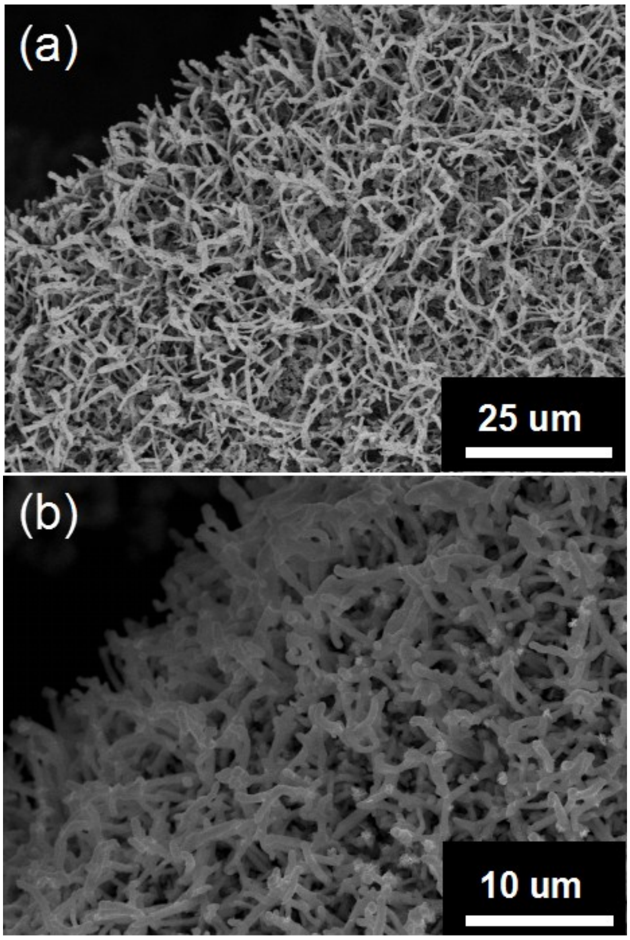

Figure S7. SEM images of NM-CNW after 12 h continuous (a) HER and (b) OER stability tests.

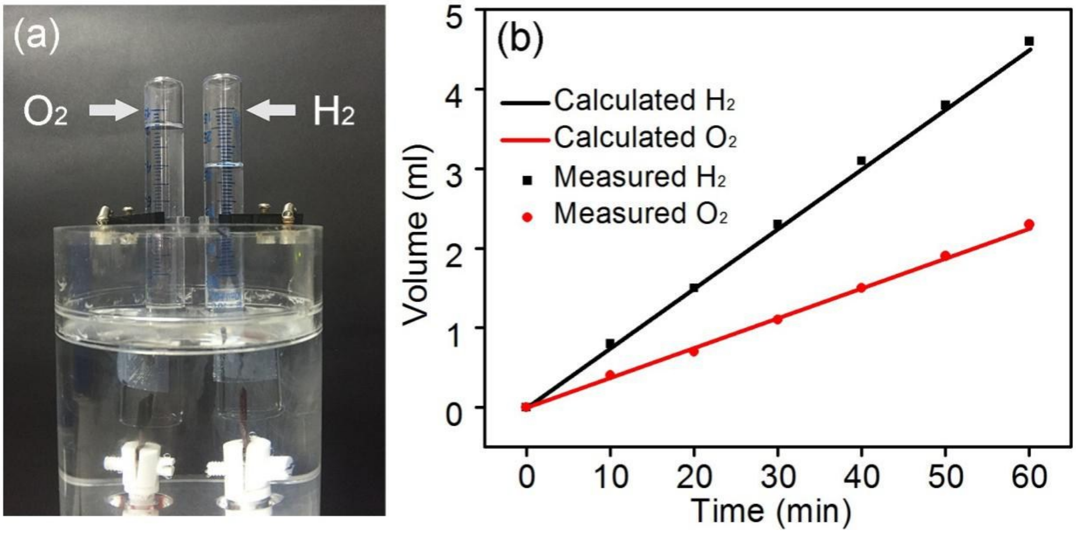

Figure S8. (a) The optical image of experimental set-ups of water displacement for collection of the evolved gas (b) generated H_2 and O_2 volumes over time versus theoretical quantities assuming a roughly 100%Faradaic efficiency for the overall water splitting of NM-CNW|NM-CNWat a constant current density of 10 mA cm^{-2}.

Faradaic efficiency calculation[S20]

Faradaic efficiency of water splitting catalyzed by NM-CNW was calculated by comparing the amount of the evolved gas with the theoretical amount of gas which is calculated by the charge passed through the electrode:

$$\text{Faradaic efficiency}_{H_2} = \frac{V_{\text{experiment}}}{V_{\text{theoretical}}} = \frac{V_{\text{experiment}}}{\frac{2}{4} \times \frac{Q}{F} \times V_m} \quad (1)$$

$$\text{Faradaic efficiency}_{O_2} = \frac{V_{\text{experiment}}}{V_{\text{theoretical}}} = \frac{V_{\text{experiment}}}{\frac{1}{4} \times \frac{Q}{F} \times V_m} \quad (2)$$

where Q is the summation of the charge passed through the electrodes, F is the Faraday constant (96485 C mol^{-1}), the number 4 means 4 moles of electrons per mole of H_2O, the number 2 means 2 moles of H_2 per mole of H_2O, the number 1 means 1 moles of O_2 per mole of H_2O and V_m is the molar volume of gas (24.1 L mol^{-1}, 293 K, 101 kPa).

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