Supporting information

Facile Synthesis of Metal/Carbide Hybrid toward Overall Water Splitting

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Table S1. Composition (at. %) of NiMo/NiMoC$_x$ and NiFeMo/NiFeMoC$_x$.

Elements	NiMo/NiMoC$_x$	NiFeMo/NiFeMoC$_x$
C	41.7	32.8
O	12.3	21.2
Ni	37.7	34.9
Fe	\	4.3
Mo	8.3	6.8

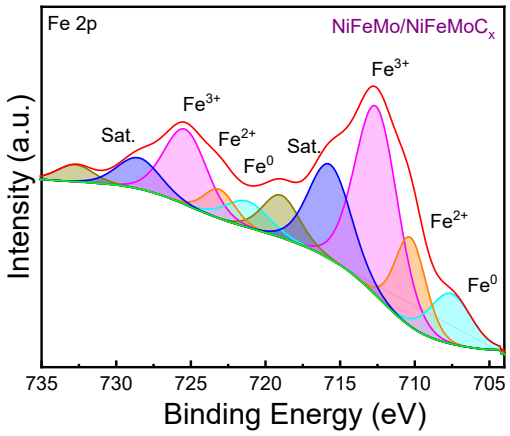


Figure S1. XPS spectra of Fe 2p of NiFeMo/NiFeMoC$_x$.

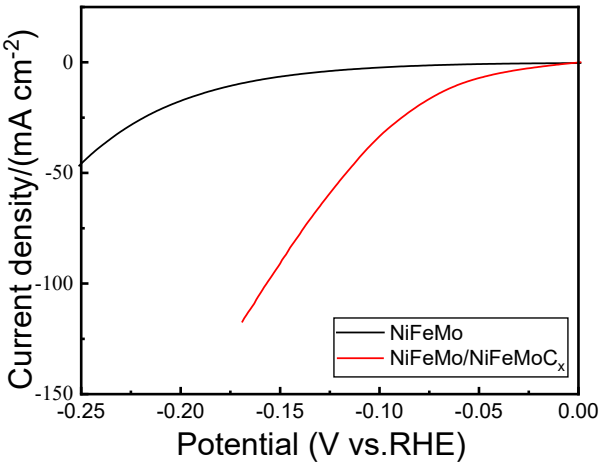


Figure S2. The iR-corrected linear sweep voltammetry curves measured at a scan rate of 5 mV s^{-1} in 1M KOH.

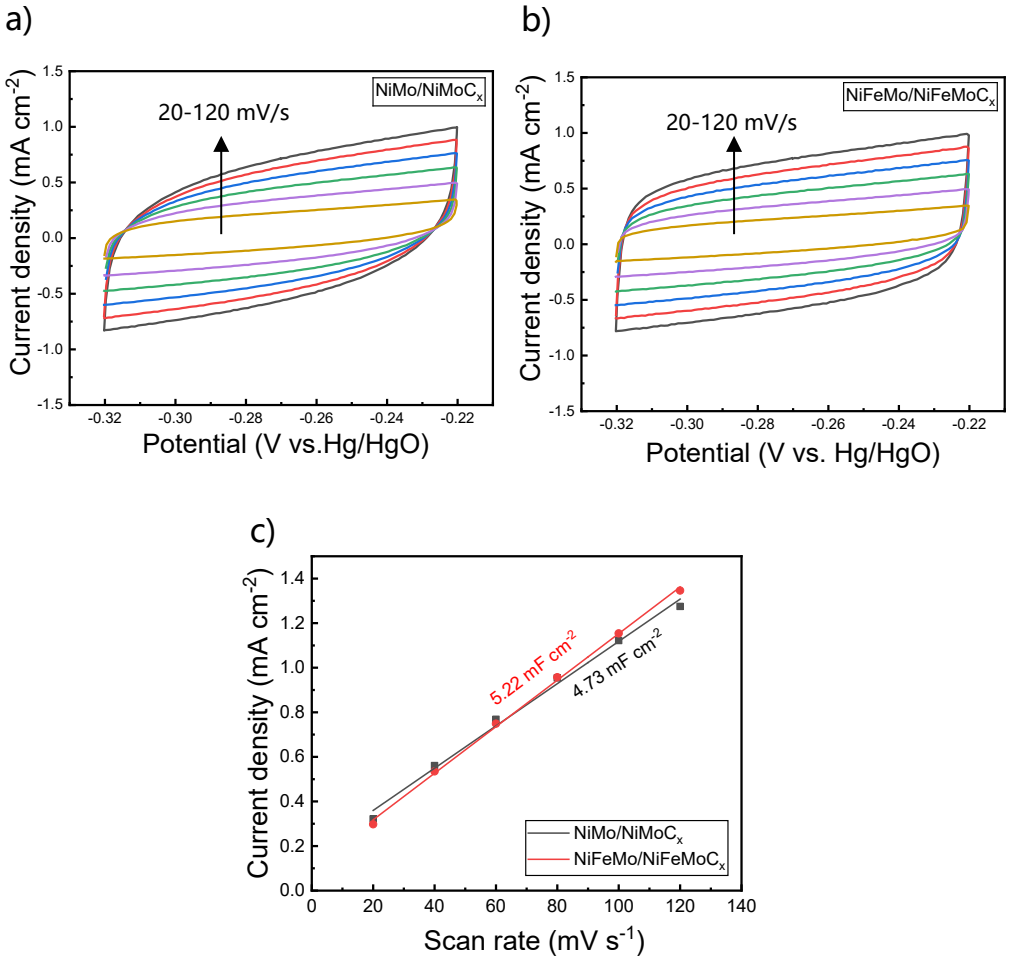


Figure S3. CV curves recorded at different scan rates for (a) NiMo/NiMoCx and (b) NiFeMo/NiFeMoCx. (c) Linear plots of capacitive current density vs. scan rate.

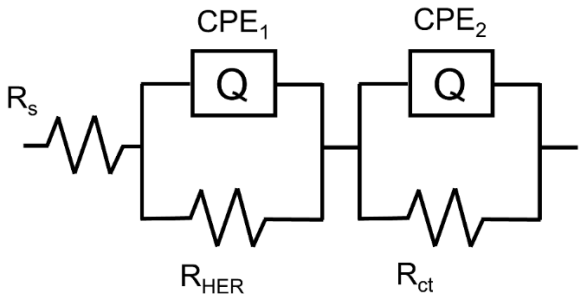


Figure S4. Equivalent circuit used to fit the EIS data of HER.

Table S2. Electrical elements fitted by the equivalent circuit in Figure S4.

	R_s / Ω	CPE_1 / mF	R_{HER} / Ω	CPE_2 / mF	R_{ct} / Ω
NiMo/$NiMoC_x$	1.93	2.33	1.33	0.29	2.30
NiFeMo/$NiFeMoC_x$	1.82	3.54	1.11	0.39	2.06

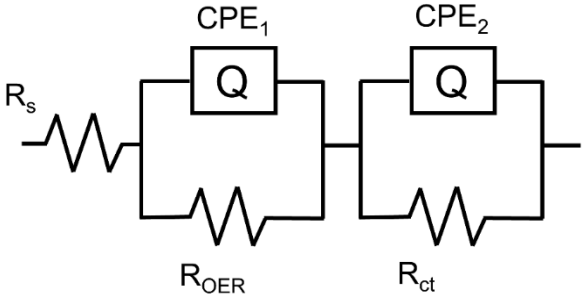


Figure S5. Equivalent circuit used to fit the EIS data of OER.

Table S3. Electrical elements fitted by the equivalent circuit in Figure S5.

	R_s / Ω	CPE_1 / mF	R_{OER} / Ω	CPE_2 / mF	R_{ct} / Ω
NiMo/$NiMoC_x$	1.85	0.80	1.12	0.25	9.11
NiFeMo/$NiFeMoC_x$	1.79	0.63	0.19	0.63	0.57

Table S4. Performance comparison between NiFeMo/NiFeMoC_x and recently reported non- precious water splitting catalysts

Material	Solution	HER η_{10} (mV)	OER η_{10} (mV)	Overall water splitting voltage (V)	Reference
NiFeMo/NiFeMoC_x	1 M KOH	64	230	1.52	this work
NiFe-NCs	1 M KOH	197	271	1.67	[1]
$FeN_{0.023}/Mo_2C/C$	1 M KOH	76	227	1.55	[2]
Ni-1T/2H–MoS_2 NPs	1 M KOH	117	250	1.36	[3]
$NiCo_2Se_4$	1 M KOH	122	245	1.58	[4]
NiCo alloy NCAs	1 M KOH	156	320	1.688	[5]
Mn–W–CoP/NF	1 M KOH	95.8	229.2	1.57	[6]
$Ni_5P_{4-x}I_x/Ni_2P$	1 M KOH	46	163	1.46	[7]
FeS_2/Fe–Ni_3S_2	1 M KOH	105	180	1.5	[8]
CoFe-MOF@CNT	1 M KOH	164	246	1.614	[9]
RuO_2-Co_3O_4	1 M KOH	75	260	1.54	[10]

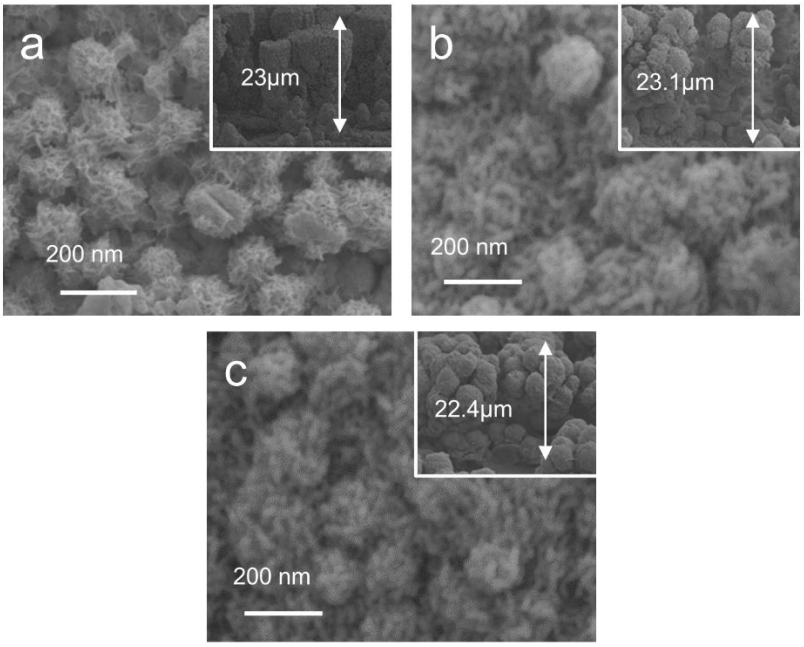


Figure S6. SEM images of NiFeMo/NiFeMoC$_x$, (a) before stability test, (b) after OER and (c) after HER. Inset: the corresponding cross-section image.

Table S5. Element content (at. %) of NiFeMo/NiFeMoC$_x$ before and after stability test.

Elements	As prepared	After HER	After OER
C	32.8	35.2	26.4
O	21.2	20.5	35.6
Ni	32.9	32.4	27.3
Fe	6.3	6.1	5.7
Mo	6.8	5.8	5.1

Reference

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