Supporting Information

Synthesis of MoP decorated carbon cloth as a binder-free electrode for hydrogen evolution

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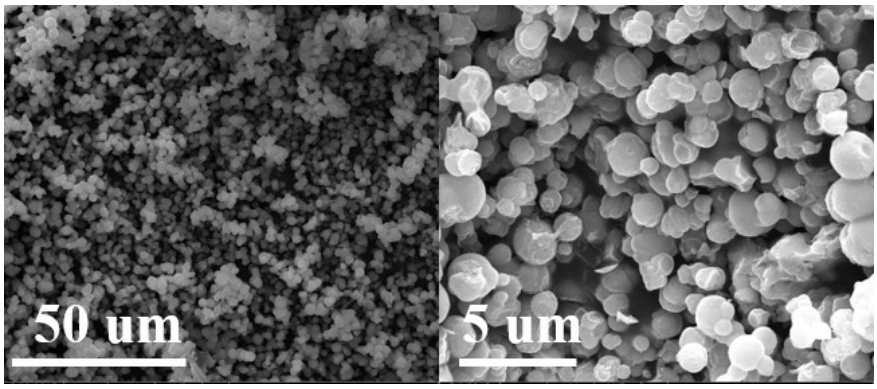

Fig. S1 (a) (b) SEM images of molybdenum phosphide microspheres (MoP-MS) at different magnification.

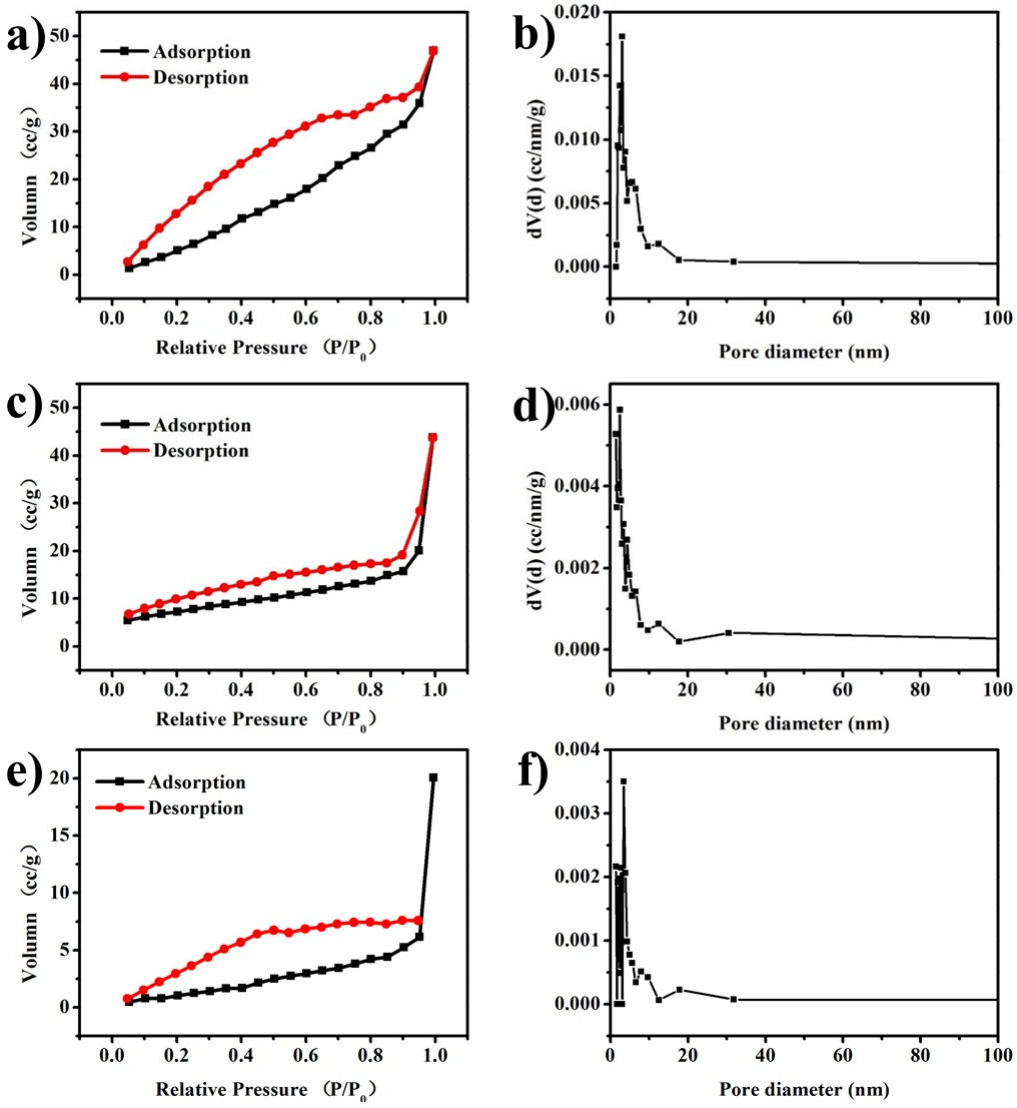

Fig. S2 Nitrogen adsorption/desorption isotherm plots and the BJH pore–size distribution curves of (a) (b) MoP-HS@CC, (c) (d) MoP-MS and (e) (f) CC.

Table S1 The details of the BET results of MoP-HS@CC, MoP-MS and CC

	Surface areas /m²	Pore Volume / cc/g	Average pore sizes /nm
MoP-HS@CC	48.98	0.0726	5.93
MoP-MS	25.81	0.0677	10.50
CC	5.09	0.0310	24.36

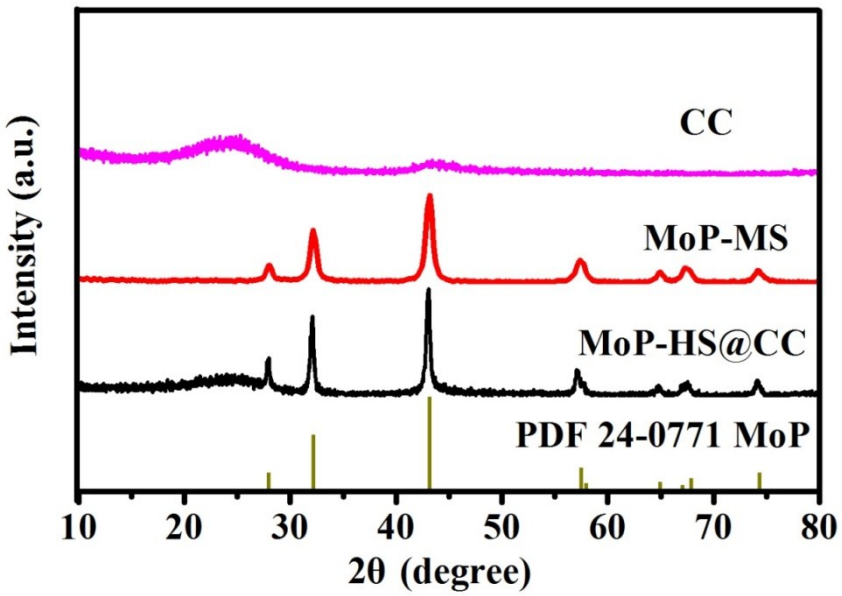

Fig. S3 XRD patterns of 3D MoP-HS@CC, MoP-MS and CC.

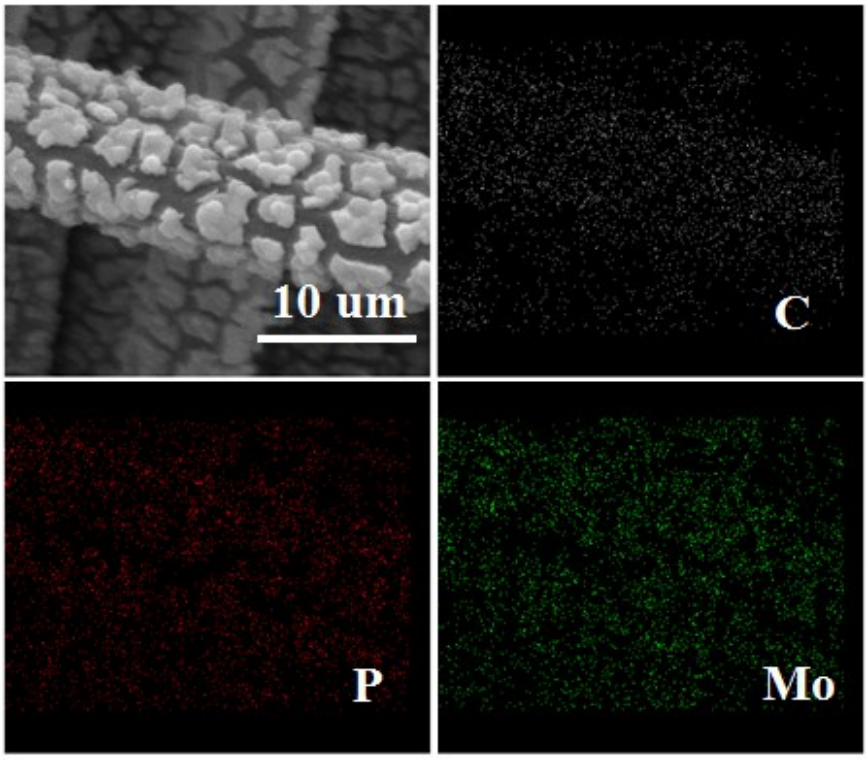

Fig. S4 EDS elemental mappings of Mo, P and C at the surface of MoP-HS@CC.

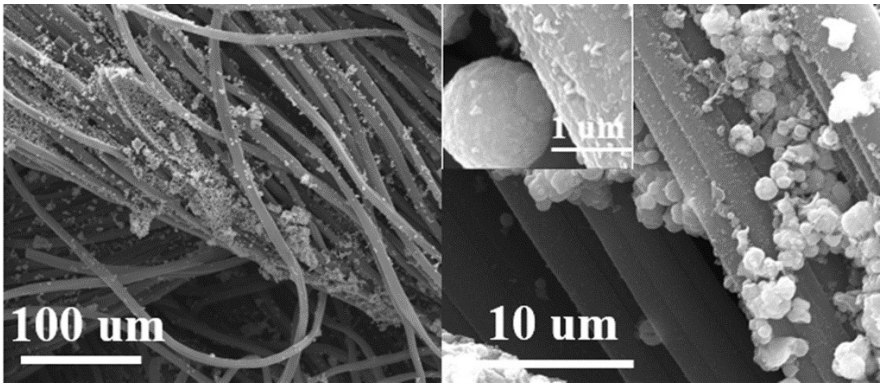

Fig. S5 (a) (b) SEM images of MoP-MS/CC at different magnification.

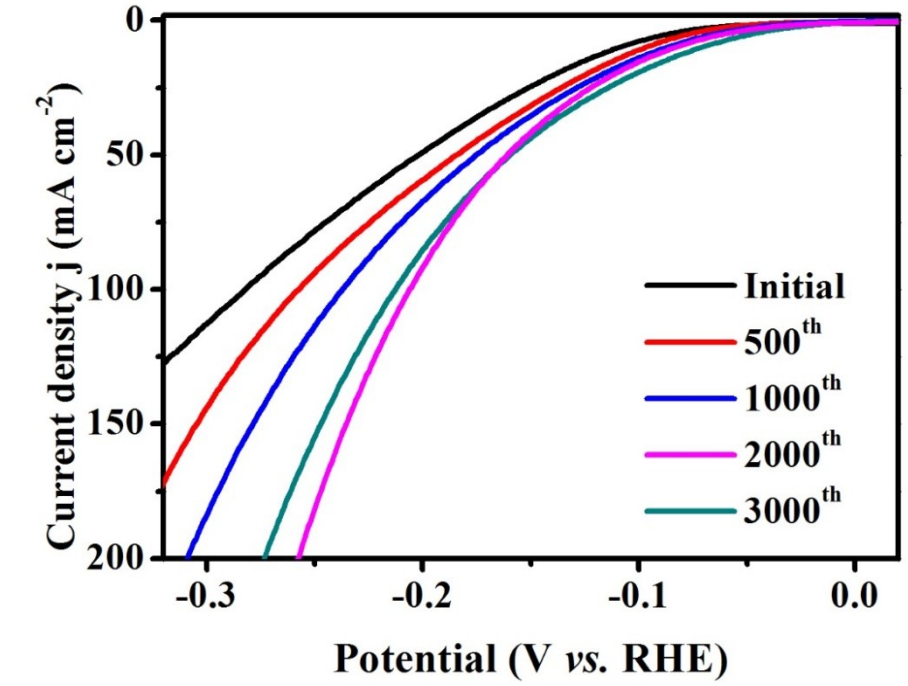

Fig. S6 Polarization curves of MoP-HS@CC that electrochemically activated at different cycles in 0.5 M H_2SO_4 at a scan rate of 100 mV s^{-1}.

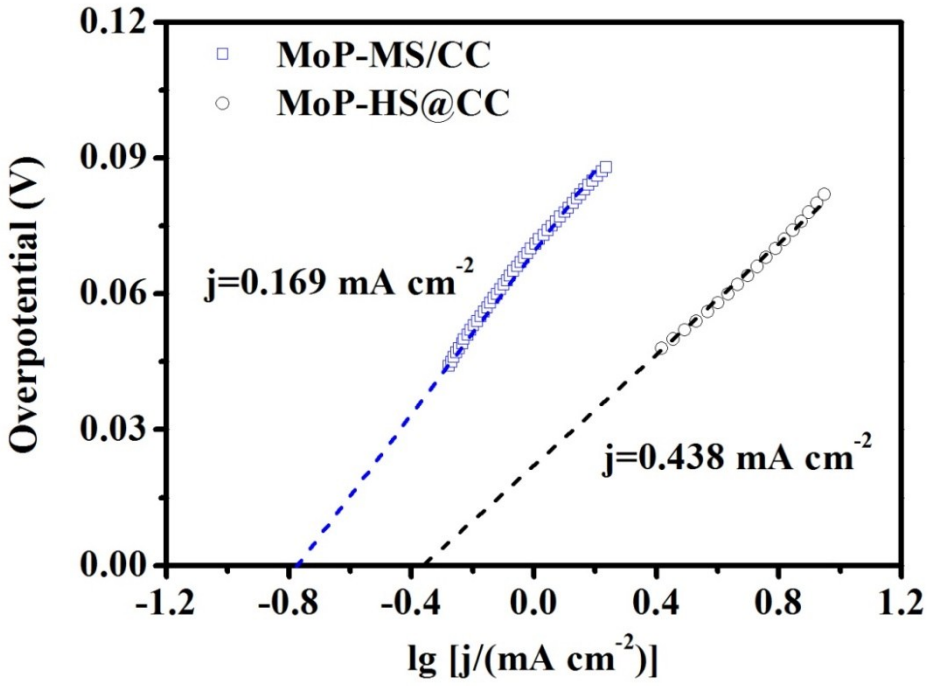

Fig. S7 Exchange current densities for different catalysts extracted from Tafel plots.

Table S2 Comparison of HER performance of MoP-HS@CC with other reported Mo-based or TMPs HER electrocatalysts in acidic media.

Catalyst	Tafel slope (mV/dec)	Current density j (mA cm-2)	η at the corresponding j (mV)	Exchange current density (mA cm-2)	Reference
metallic MoS_2 nanosheets	54	10	195	-	[1]
MoS_2/graphene/Ni foam	42.8	10	141	-	[2]
MoP	54	30	180	3.4×10-2	[3]
MoP	60	10	246	4.15×10-3	[4]
MoP network	54	10	125	8.6×10-2	[5]
amorphous MoP NPs	45	10	90	1.2×10-1	[6]
WP/CC	69	10	130	0.29	[7]
WP_2 SMP	57	10	161	0.017	[8]
CoP/CNT	54	10	122	0.13	[9]
CoP nanotubes	60	10	144	-	[10]
CoP/CC	51	10	67	0.288	[11]
CoP/Ti	43	10	90	-	[12]
FeP NAs/Ti	60	10	85	-	[13]
NiP_2 NS/CC	51	10	75	0.26	[14]
$MoSe_2$	69	10	182	0.021	[15]
MoP-graphite	63	30	300	6.367×10-2	[16]
MoP nanosheets /CF	56.4	10.1	200	-	[17]
MoP-HS@CC	61	10 20 100	87 112 195	0.438	This work
MoP-MS/CC	92	10	147	0.169	This work

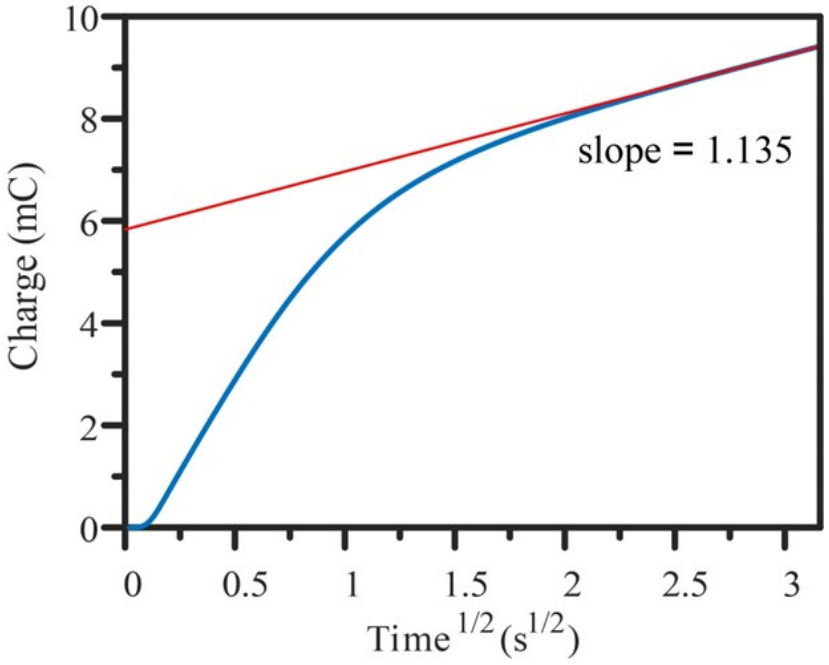

Fig. S8 The chronocoulometry plots for the electrodes in mixed solution of 0.1 mM $K_3[Fe(CN)_6]$ and 0.1 M KCl at room temperature.

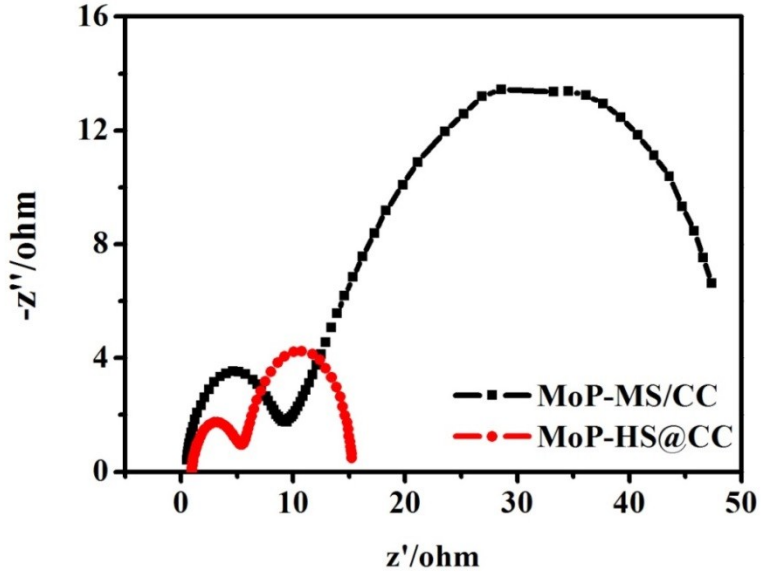

Fig. S9 The Nyquist plots of MoP-HS@CC and MoP-MS/CC recorded in 0.5 M H_2SO_4 solution at the potential of 100 mV.

Table S3 Comparison of HER performance of 3D MoP-HS@CC with other reported non-noble metal HER electrocatalysts in basic media.

Catalyst	**Tafel slope (mV/dec)**	**Current density j (mA cm^{-2})**	**η at the corresponding j (mV)**	**Reference**
Co-NRCNTs	-	10	370	[18]
MoP	48	10	130	[3]
bulk MoB	59	10	225	[19]
WP/CC	102	10	150	[7]
WP_2 SMP	60	10	153	[8]
Ni_2P nanoparticles	100	20	250	[20]
CoP/CC	129	10	209	[11]
11FeP NAs/CC	146	10	218	[21]
NiP_2 NS/CC	64	10	102	[14]
MoP-HS@CC	64	10	121	This work
		100	223	

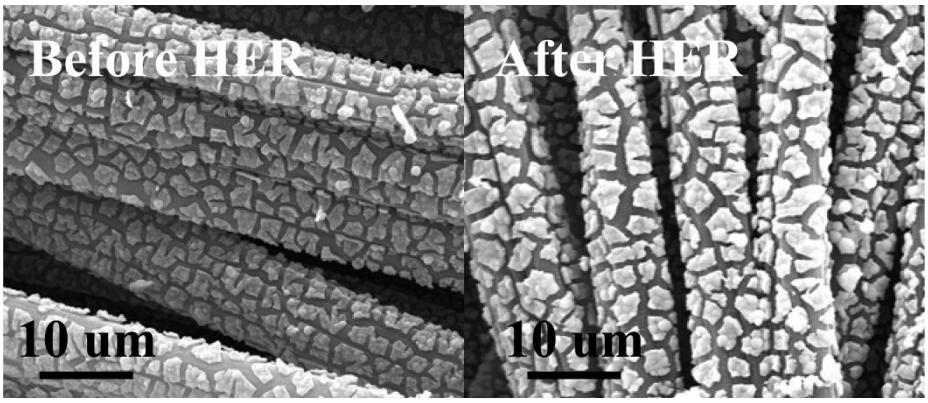

Fig. S10 SEM images of MoP-HS@CC before and after long-term stability test

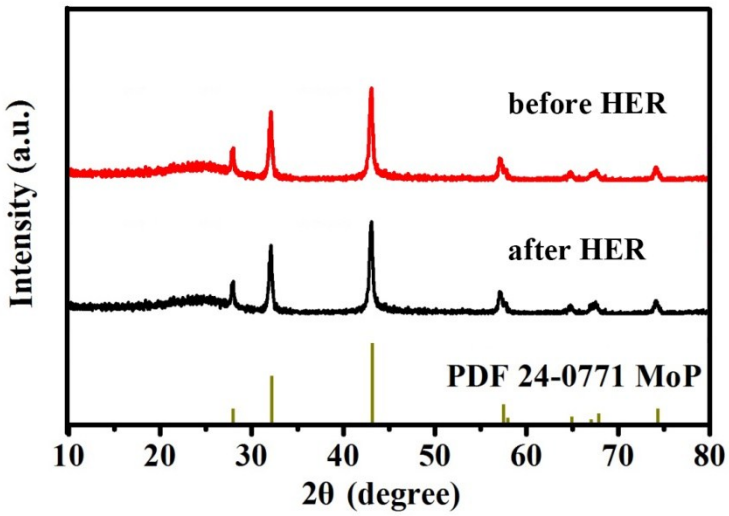

Fig. S11 XRD pattern of MoP-HS@CC before and after long-term stability test

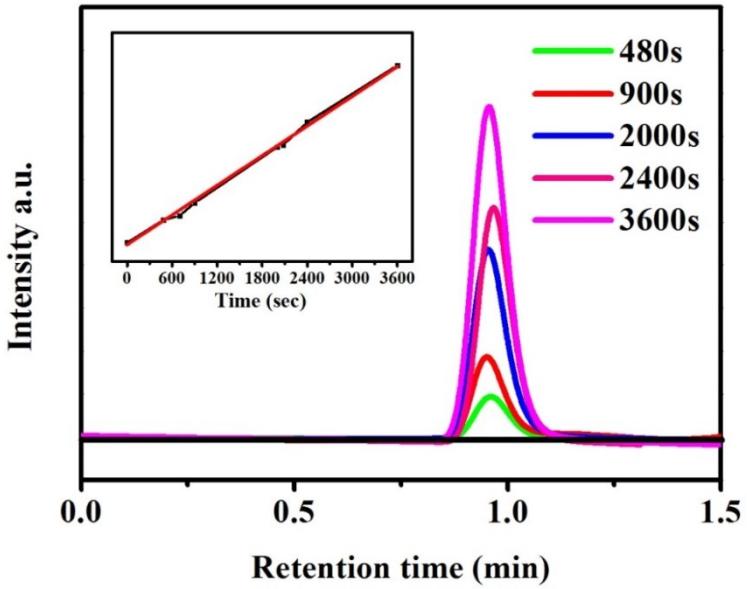

Fig. S12 The GC chromatograph of H_2 gas production obtained with MoP-HS@CC under electrolysis at -0.2 V (vs. RHE) for 1h. The inset shows the volume of hydrogen and the testing time.

Supplementary Movie

Movie S1 This movie shows the dynamic hydrogen production process at MoP@CC operated from +0.1 V to -0.3 V vs. RHE.

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