

Supporting Information

Interconnected Hollow Cobalt Phosphide Grown on Carbon Nanotubes for Hydrogen Evolution Reaction

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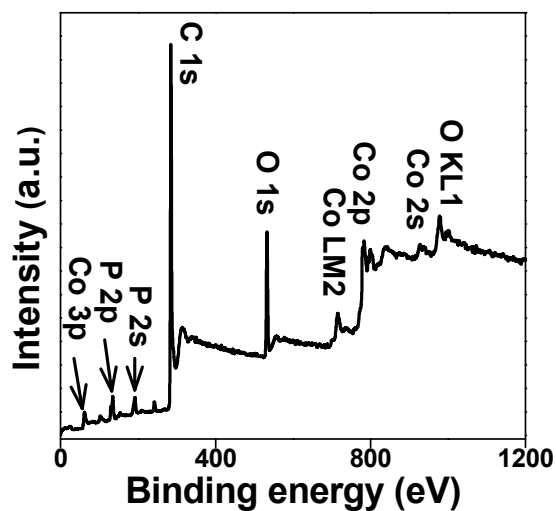


Figure S1. XPS survey scan spectrum of HI-CoP/CNT.

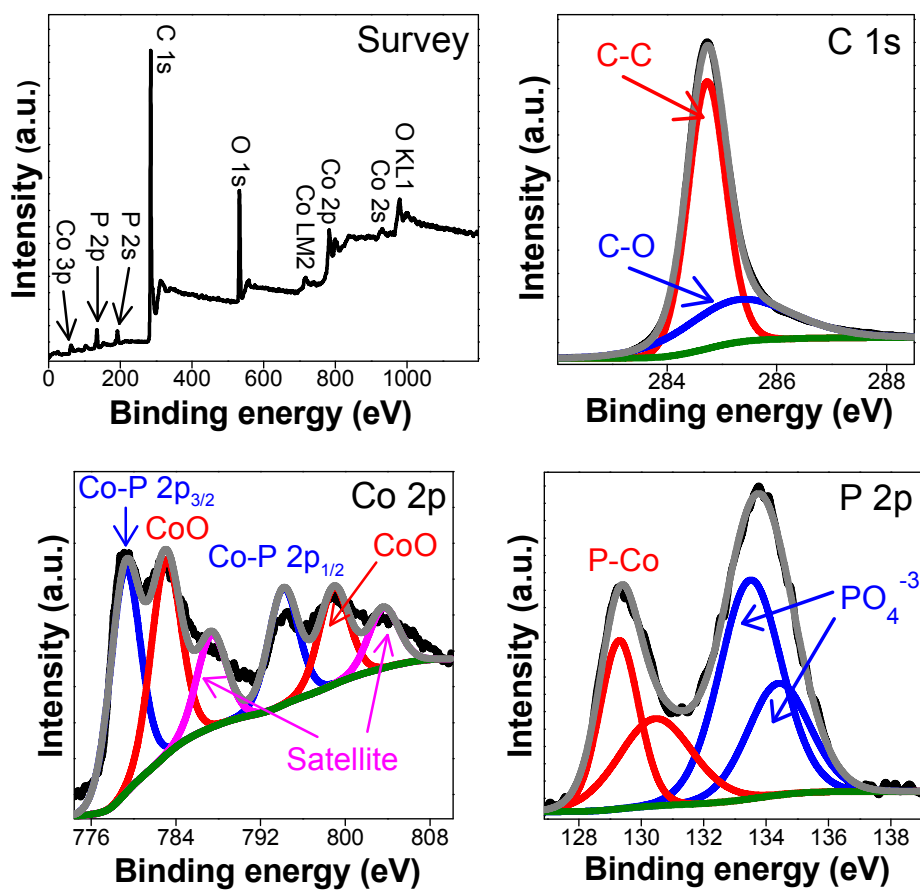


Figure S2. XPS signatures of CoP/CNT (prepared in the absence of HMT).

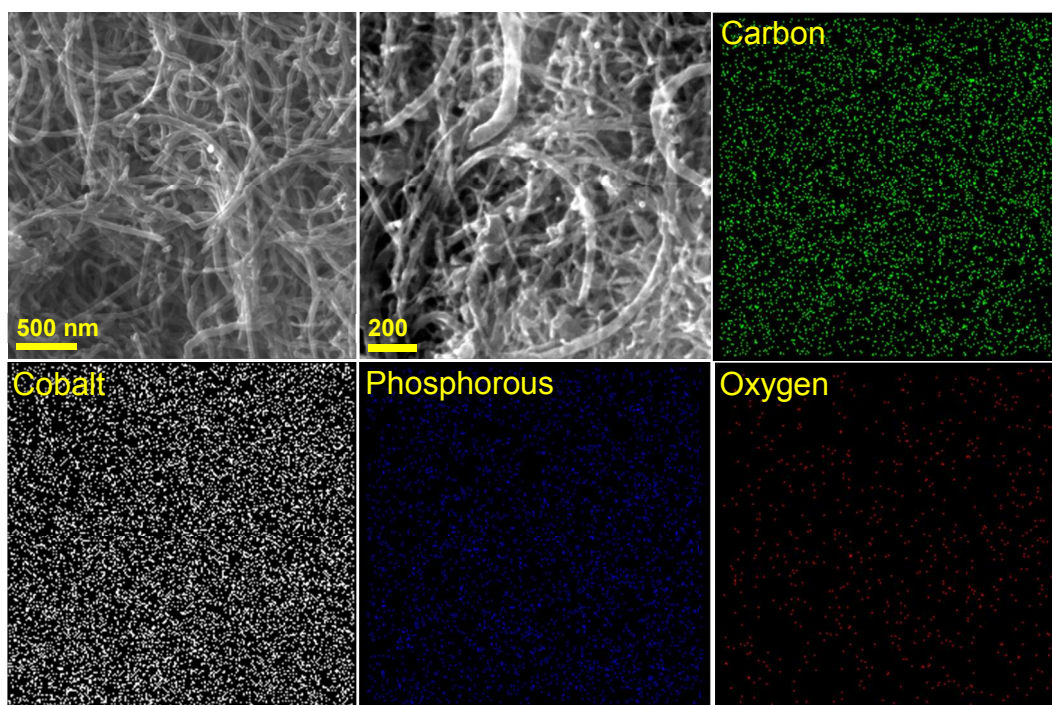


Figure S3. FESEM and elemental mapping of HI-CoP/CNT.

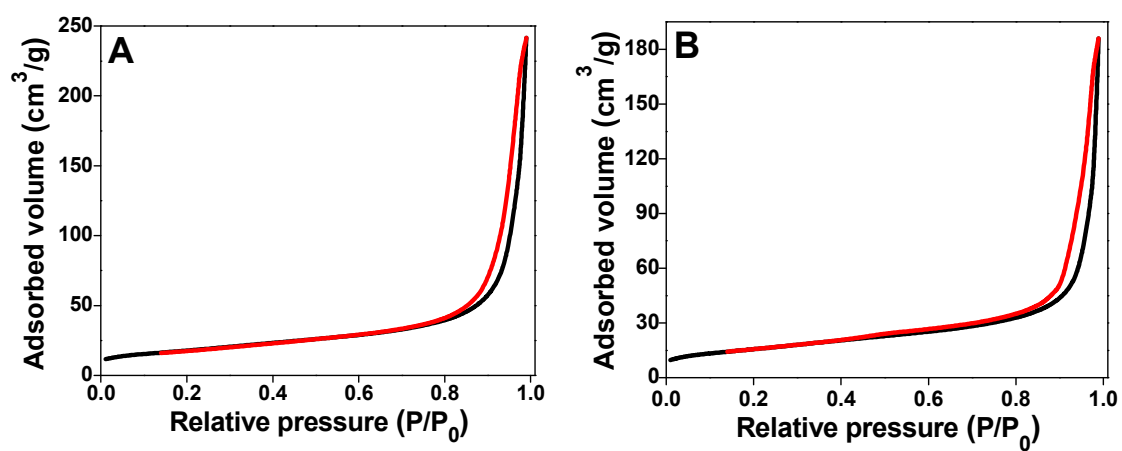


Figure S4. N₂ adsorption-desorption isotherm of (A) HI-CoP/CNT and (B) CoP/CNT.

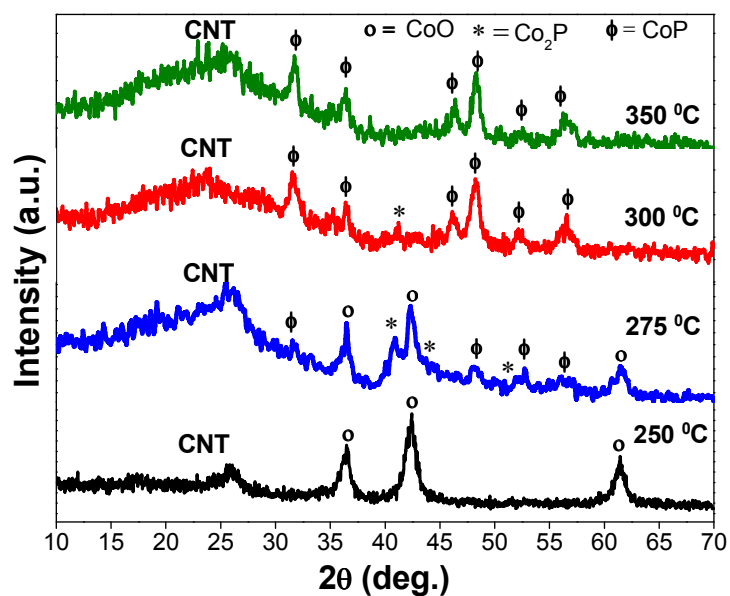


Figure S5. Temperature-dependent phase evolution of the HMT-cobalt complex.

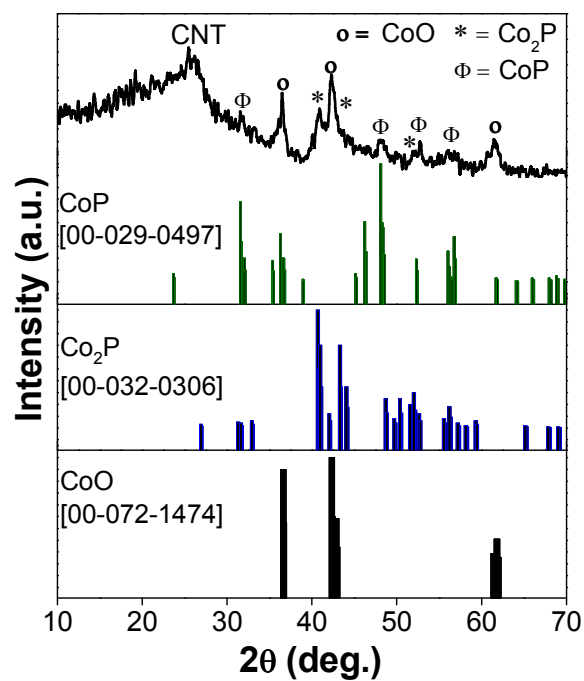


Figure S6. Comparison of XRD patterns of HMT-derived sample obtained at 275 °C with those of standard diffraction patterns of CoO, Co₂P and CoP.

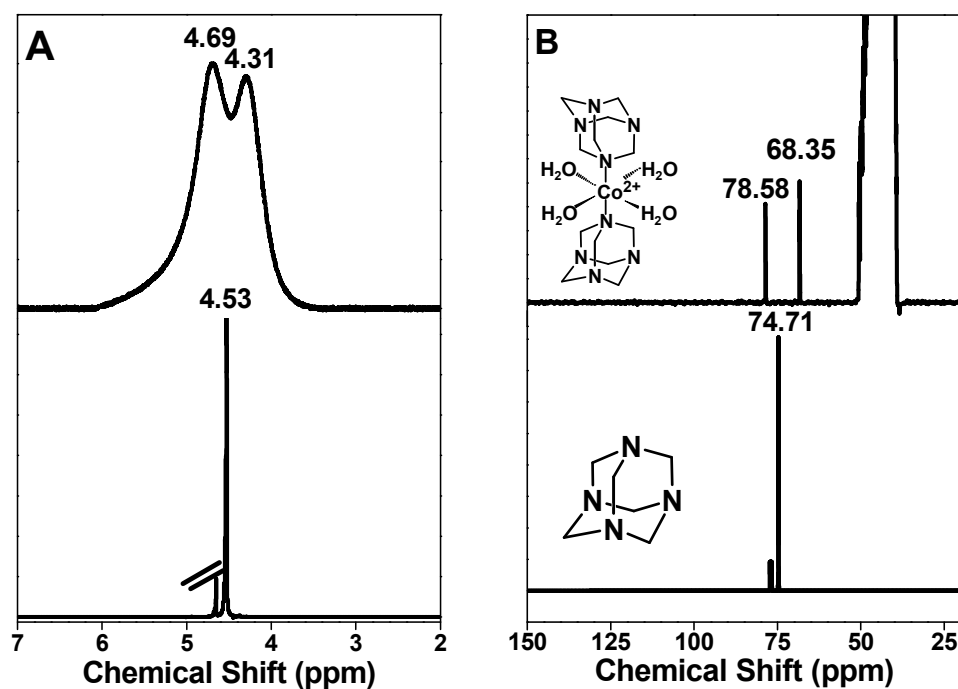


Figure S7. ^1H NMR (A) and ^{13}C NMR (B) of HMT (bottom) and its solution with $\text{Co}(\text{CH}_3\text{COO})_2 \cdot 4\text{H}_2\text{O}$ and ethanol (top).

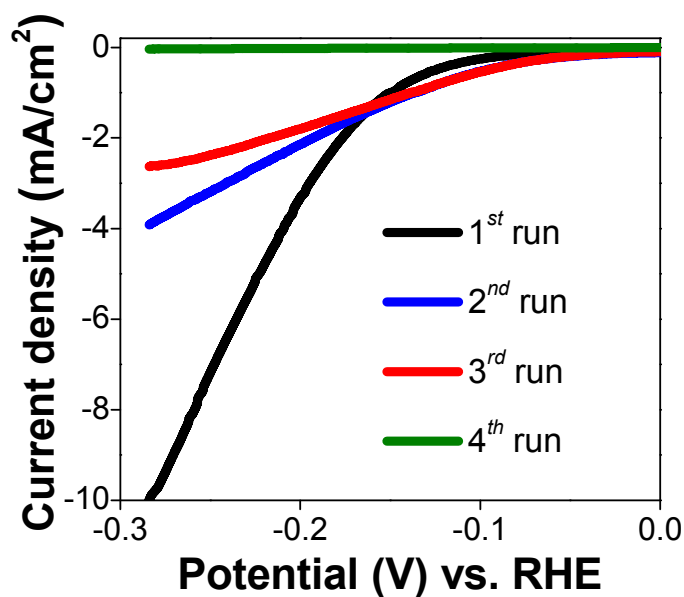


Figure S8. Polarization curves of HMT-derived CoO/CNT as a function of LSV cycles. The curves indicate the dissolution of CoO in 0.5 M H_2SO_4 .

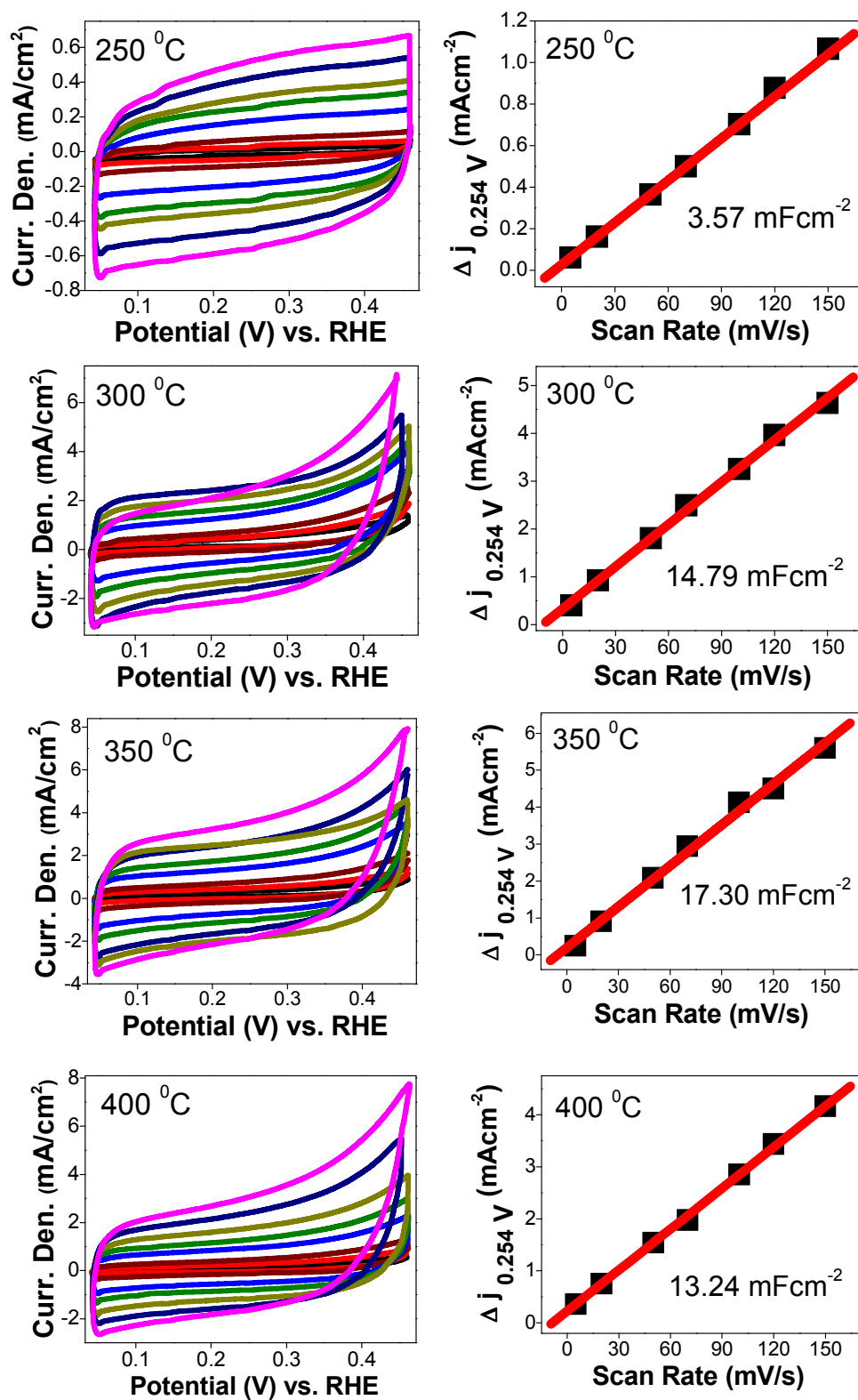


Figure S9. Cyclic voltammograms and their corresponding plots of the current density at 0.254 V_{RHE} vs. scan rate.

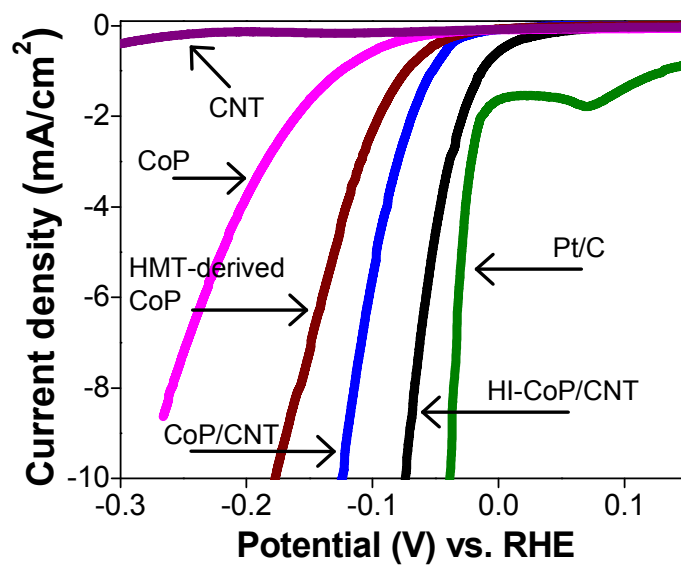


Figure S10. Comparative polarization curves of Pt/C, HI-CoP/CNT, CoP/CNT, CoP prepared with and without HMT and CNT in acidic medium.

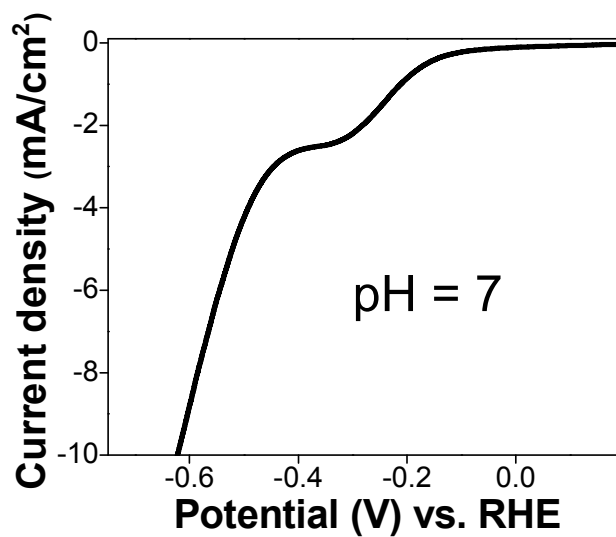


Figure S11. Polarization curve of HI-CoP/CNT in neutral medium.

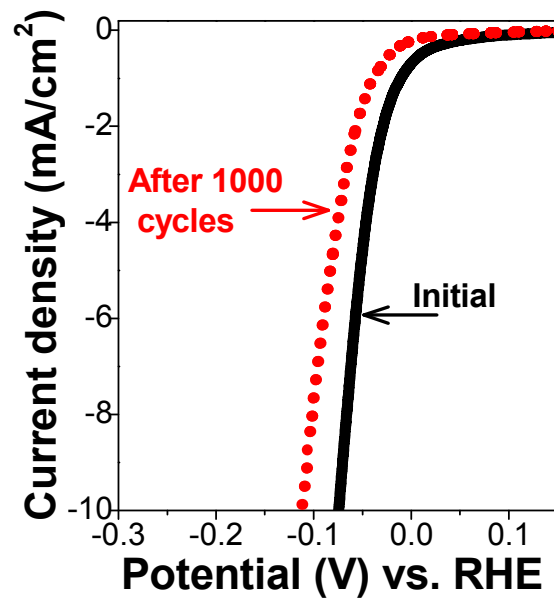


Figure S12. Polarization curves obtained before and after 1000 potentiodynamic sweeps in 0.5 M H₂SO₄.

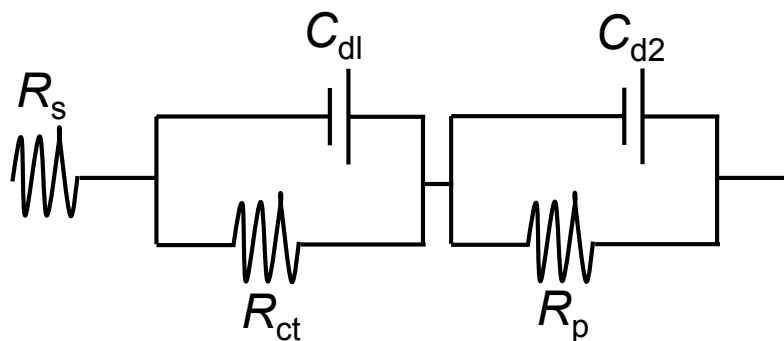


Figure S13. Two time constant electrical equivalent circuit model utilized to fit the electrochemical impedance (EIS) results of hydrogen evolution reaction. R_s – series resistance, C_{dl} and C_{d2} are double layer capacitance, R_{ct} – charge transfer resistance for HER, R_p – resistance related to the surface porosity.

Table S1. Performance comparison of CoP-based electrocatalysts for HER.

Catalysts	Electrolyte	Overpotential (mV)		Tafel slope (mVdec ¹)	Catalyst loading (mg cm ⁻²)
		η_{10}	η_{20}		
CoP@NPC ¹	0.5 M H ₂ SO ₄	123	156	69	0.255
CoP/Ti ²	0.5 M H ₂ SO ₄	-	85	50	2
CoP/carbon cloth ³	0.5 M H ₂ SO ₄	67	100	51	0.92
Co ₂ P nanorod/ Ti ⁴	0.5 M H ₂ SO ₄	134	167	71	1
CoP/CNTs ⁵	0.5 M H ₂ SO ₄	122	160	54	0.285
CoP/C ⁶	0.1 M KOH	-	250	-	-
CoP nanosheet/C ⁷	1 M KOH	111	139	70.9	0.71
Porous CoP/Ti ⁸	1 M KOH	-	150	71	0.8
Porous CoP/Ti ⁹	0.5 M H ₂ SO ₄	-	95	65	0.8
CoP/CNT ⁹	0.1 M NaOH	215	-	56	0.285
CoP cluster ¹⁰	0.5 M H ₂ SO ₄	85	-	50	-
CoP/NC ¹¹	1 M KOH	154	173	51	1
CoP/CNTs ¹²	0.5 M H ₂ SO ₄	139	-	52	0.84
CoP/RGO ¹³	0.5 M H ₂ SO ₄	~260	-	104.8	0.29
CoP nanowires ¹⁴	0.5M H ₂ SO ₄	110	142	54	0.35
CoP nanosheets ¹⁴	0.5 M H ₂ SO ₄	164	-	61	0.35
CoP nanotubes ¹⁵	0.05 M H ₂ SO ₄	129	-	60	0.2
Hollow CoP/NG ¹⁶	1 M KOH	83	100	57	2.5
CoP/NCNT ¹⁷	0.5 M H ₂ SO ₄	79	99	58.5	~0.2
CoP/CNT ^{This work}	0.5 M H ₂ SO ₄	73	102	54.6	1

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