Electronic Supplementary Information

CoP nanostructures with different morphologies: synthesis, characterization and study of their electrocatalytic performace toward hydrogen evolution reaction

Ping Jiang,[a] Qian Liu,[a] Chenjiao Ge,[a] Wei Cui,[a] Zonghua Pu,[a] Abdullah M. Asiri[b,c] and Xuping Sun[a,b,c]*

[a] State Key Lab of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, Jilin, China

[b] Chemistry Department, Faculty of Science, King Abdulaziz University, Jeddah 21589, Saudi Arabia

[c] Center of Excellence for Advanced Materials Research, King Abdulaziz University, Jeddah 21589, Saudi Arabia

*To whom correspondence should be addressed. Tel/Fax: +86-431-85262065. E-mail: sunxp@ciac.ac.cn

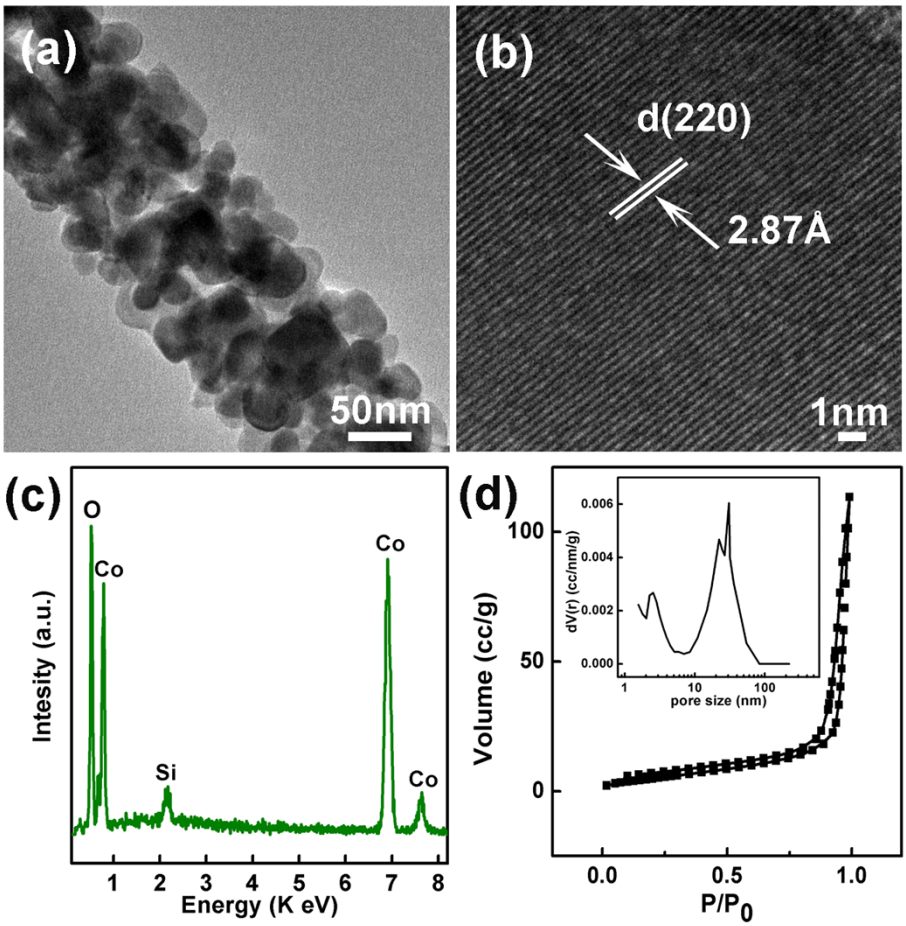

Fig. S1 (a) TEM and (b) HRTEM images taken from one single Co_3O_4 nanowire. (c) EDX spectrum of Co_3O_4 NWs. (d) Nitrogen adsorption/desorption isotherm plot and Barrett-Joyner-Halenda (BJH) pore-size distribution curve (inset) of nanoporous Co_3O_4 NWs.

Table S1 Comparison of HER performance in acidic electrolytes for CoP nanostructures developed in this study with other non-noble-metal HER electrocatalysts (*[a]* catalysts directly grown on current collectors).

Catalyst	Tafel slope (mV/dec)	Current density (*j*, mA/cm^2)	*η* at the corresponding *j* (mV)	Exchange current density (mA/cm^2)	Ref.
double-gyroid MoS_2/FTO[a]	50	2	190	6.9×10^{-4}	6c
metallic MoS_2 nanosheets	54	10	195	-	6d
defect-rich MoS_2	50	13	200	8.91×10^{-3}	6e
MoS_2/graphene/Ni foam[a]	42.8	10	141	-	6f
		100	263		
MoO_3-MoS_2/FTO[a]	50-60	10	310	8.2×10^{-5}	6j
bulk Mo_2C	56	1	~150	1.3×10^{-3}	6l
bulk MoB	55	1	~150	1.4×10^{-3}	6l
$NiMoN_x$/C	35.9	2	170	0.24	6p
$Co_{0.6}Mo_{1.4}N_2$	-	10	200	0.23	6o
Ni_2P hollow nanoparticles	46	10	116	0.033	10a
		100	180		
Ni_2P nanoparticles	87	20	140	-	10b
FeP nanosheets	67	10	~240	-	10c
interconnected network of MoP nanoparticles	54	10	125	0.086	10d
bulk MoP	54	30	180	0.034	10e
Cu_3P NWs/CF[a]	54	10	122	0.13	10f
CoP hollow nanoparticles	50	20	85	0.14	11
CoP/CNT	54	2	70	0.13	12a
		10	122		

CoP/CC[a]	51	10	67	0.288	12b
np-CoP NWs/Ti[a]	65	20	95	-	12c
$CoSe_2$ nanobelts	50	10	~120	8.4×10^{-3}	20
$CoSe_2$ NP/CP[a]	42.1	10	137	$(4.9\pm1.4)\times10^{-3}$	21
Co-NRCNTs	69	1	140	0.01	22
		10	260		
CoP NWs	54	2	65	0.15	This work
		10	110		
		20	142		
CoP NSs	61	10	164	0.054	This work
CoP NPs	87	10	221	0.032	This work

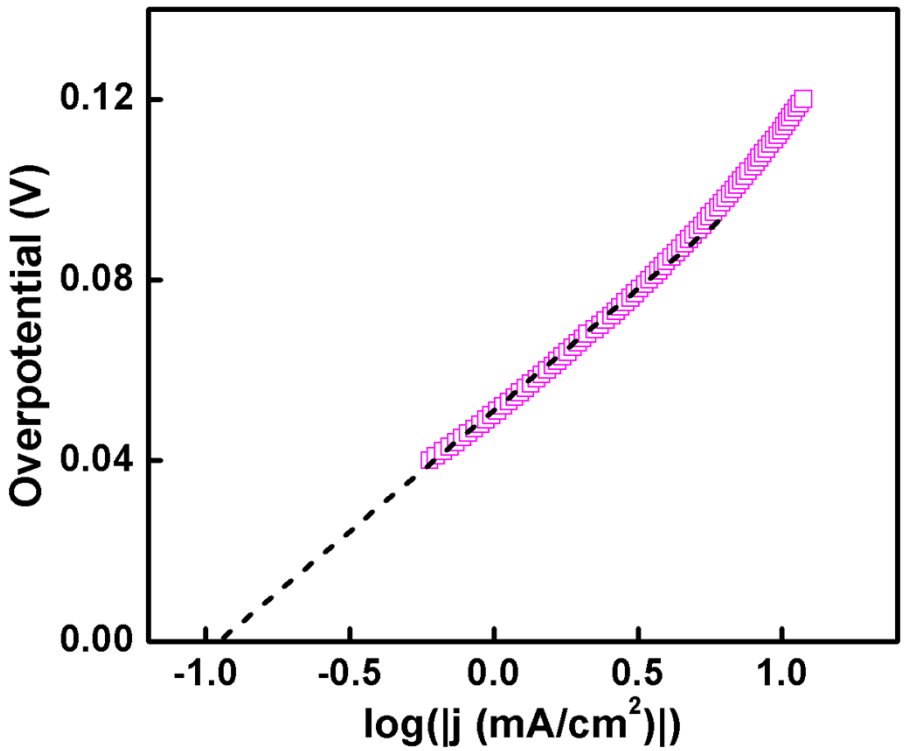

Fig. S2 Calculated exchange current density for CoP NWs in 0.5 M H_2SO_4 by applying extrapolation method to the Tafel plot.

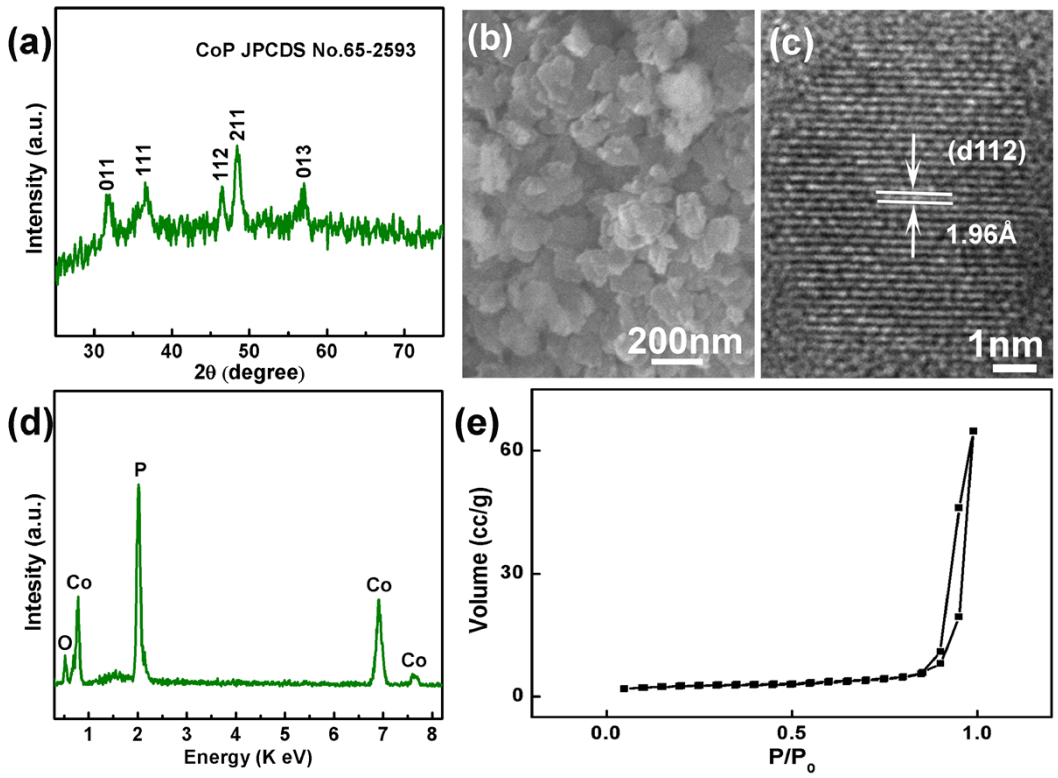

Fig. S3 (a) XRD pattern, (b) TEM image, (c) HRTEM image, (d) EDX spectrum, and (e) nitrogen adsorption/desorption isotherm plot of CoP NSs.

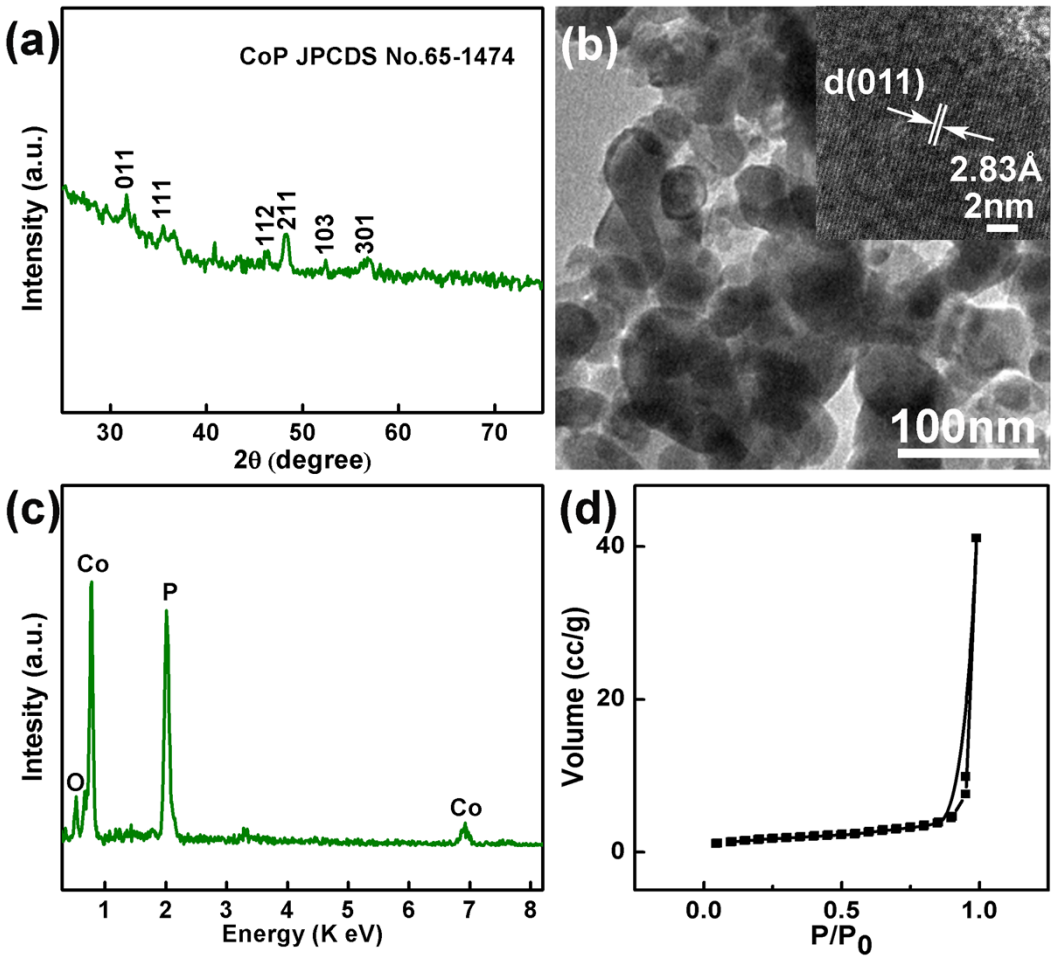

Fig. S4 (a) XRD pattern of CoP NPs. (b) TEM and HRTEM (inset) images of CoP NPs. (c) EDX spectrum and (d) nitrogen adsorption/desorption isotherm plot of CoP NPs.