Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Electronic Supplementary Information

Morphology-activity correlation in hydrogen evolution catalyzed by cobalt sulfides

Bo You, Nan Jiang and Yujie Sun*

Department of Chemistry and Biochemistry, Utah State University, Logan, Utah 84322-0300, USA E-mail: yujie.sun@usu.edu; *Fax: +1-435-797-3390; Tel: +1-435-797-7608*

Supplementary Results

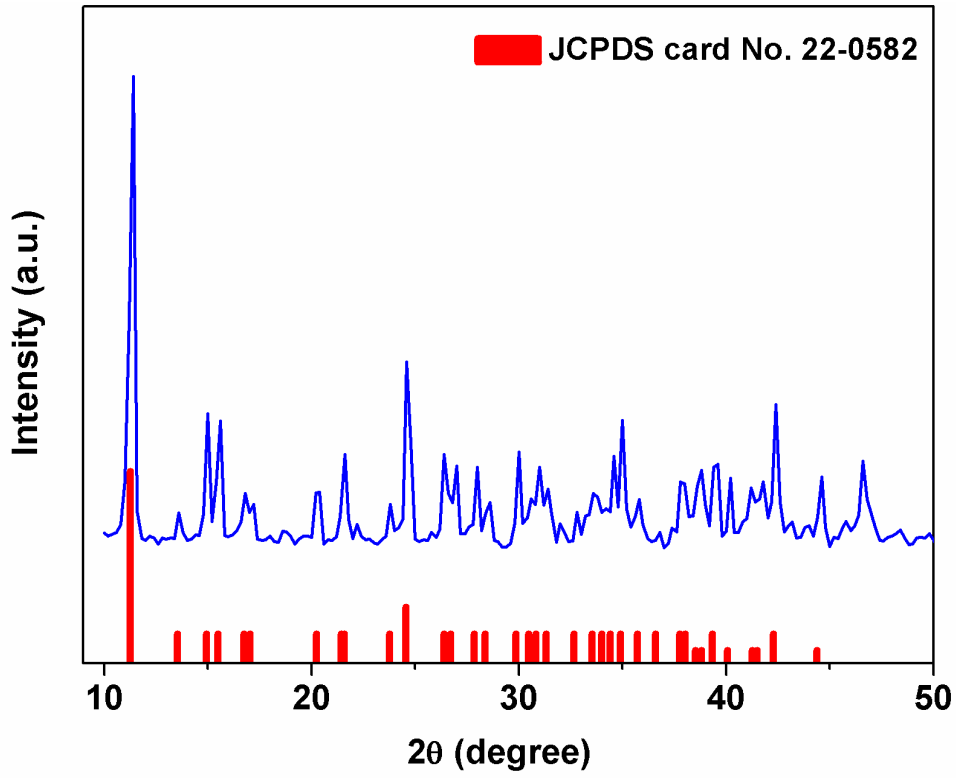

Fig. S1 XRD patterns of cobalt acetate hydroxide (CAHs) precursor

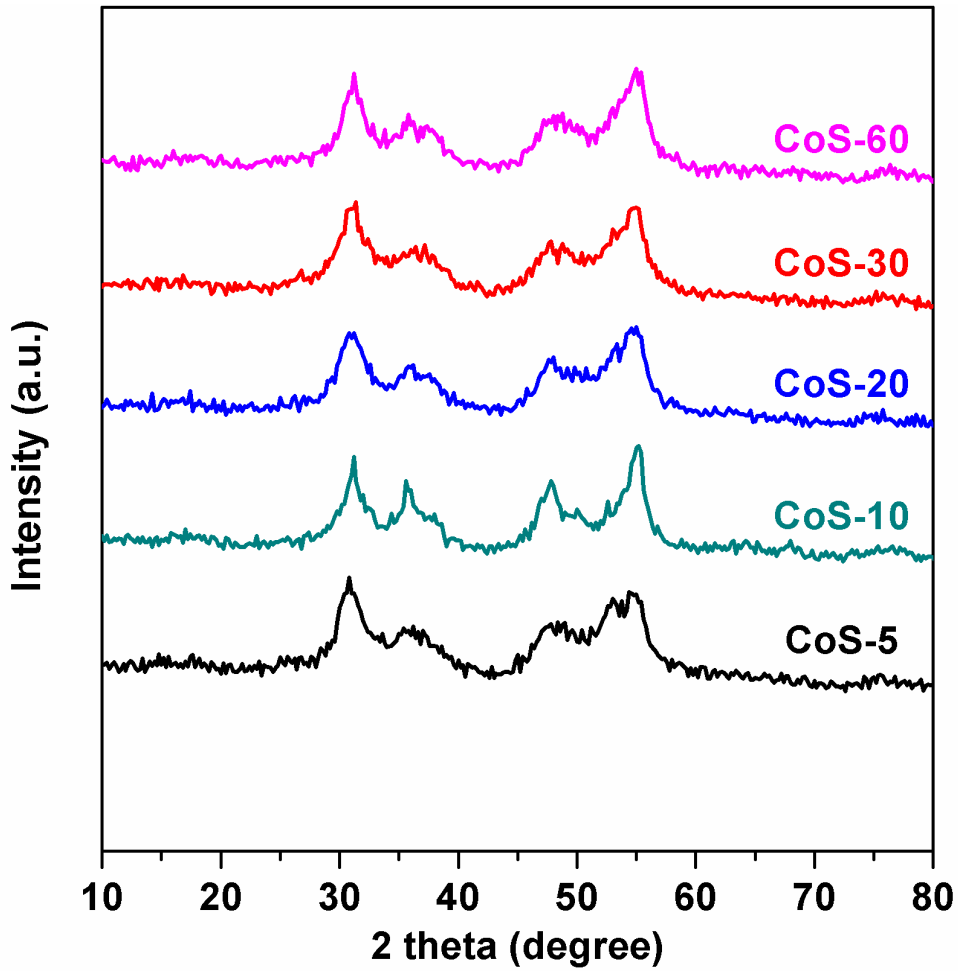

Fig. S2 XRD patterns of CoS-x samples.

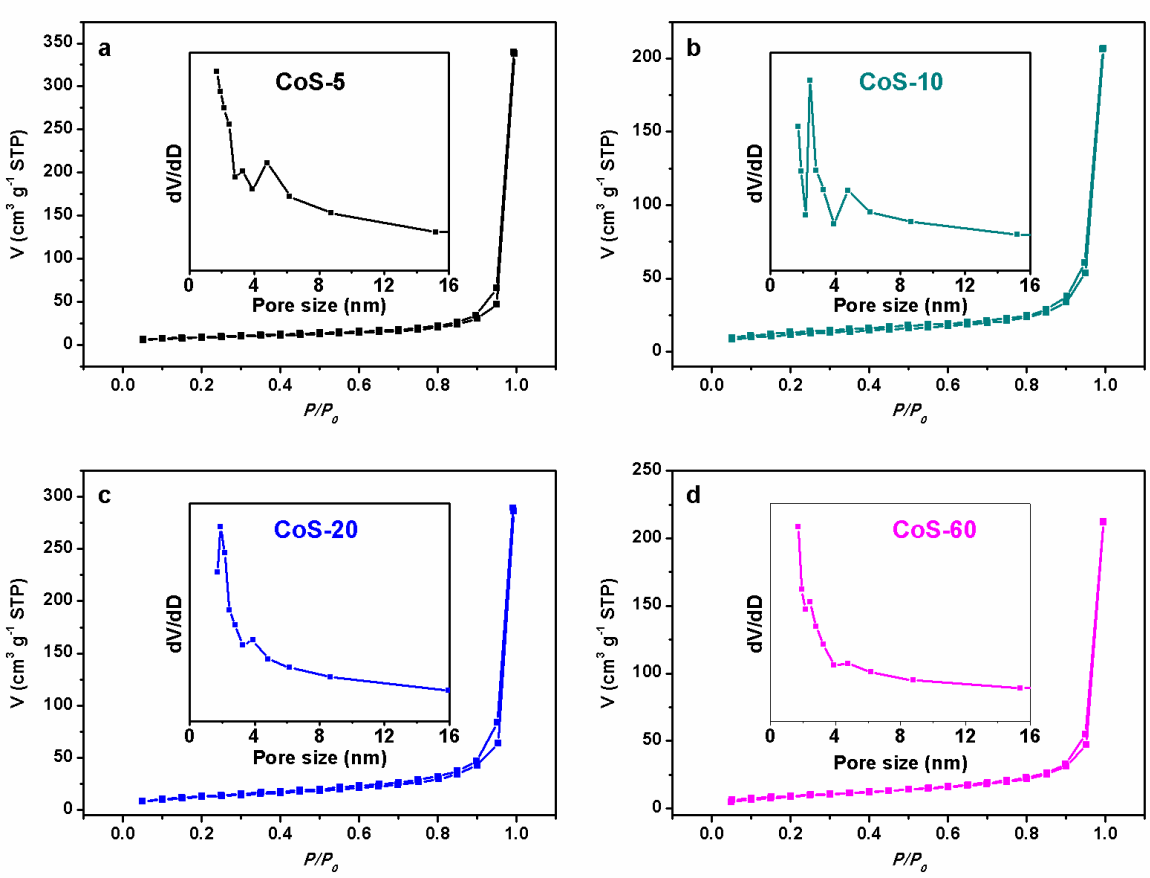

Fig. S3 N_2 sorption isotherms of (a) CoS-5, (b) CoS-10, (c) CoS-20, and (d) CoS-60 samples. The inset are the corresponding pore size distribution curves.

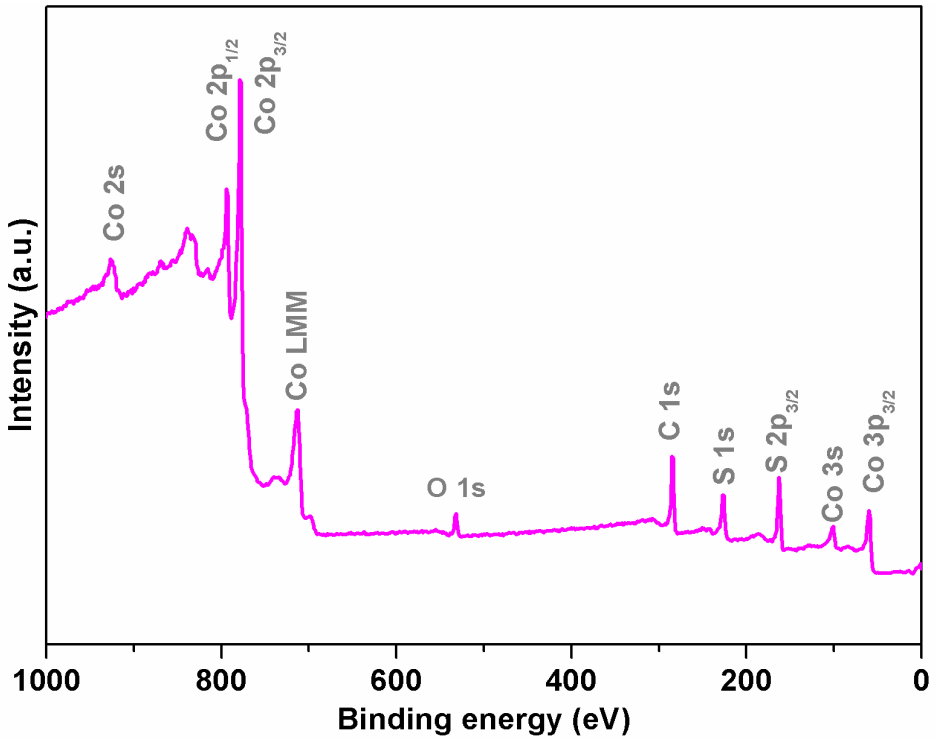

Fig. S4 XPS survey spectra of CoS-30 sample.

Table S1. Comparison of HER activity in neutral media for CoS-30 with other HER electrocatalysts.

Catalysts	Loading	Electrolyte	Tafel slope (mV dec^{-1})	η_{10} [a] (mV)	η_{50} [a] (mV)	η_{100} [a] (mV)	References
CoS-30	**0.24 mg cm^{-2}**	**1.0 M KPi**	**75**	**233**	**314**	**364**	**This work**
$MoS_{2.7}$@NPG	-	0.2 M KPi	60	>350	-	-	*Adv. Mater*., **2014**, 26, 3100.
Co-S/FTO	~1.2 mg cm^{-2}	1.0 M KPi	93	-	397	-	*J. Am. Chem. Soc.* **2013**, 135, 17699.
microCoS	-	TEOA (0.05 M) and Na_2SO_4 (0.1 M) pH=7	-	>390	-	-	*Chem. Sci.* **2014**, 5, 4906.
MW-CoS	0.283 mg cm^{-2}	1.0 M KPi	75	275	373	450	*Chem. Commun.* **2015**, 51, 4252.
CoS_2/CFP	~0.625 mg cm^{-2}	1.0 M PBS	106.7	~300	~400	-	*J. Mater. Chem. A* **2015**, 3, 6306.
Co_9S_8@C	0.3 mg cm^{-2}	1.0 M KPi	-	280	-	-	*ACS Appl. Mater. Interfaces* **2015**, 7, 980.
3DG/CoS_x	-	1.0 M PBS	93	~300	>400	-	*RSC Adv.* **2015**, 5, 6886.
H_2-CoCat/FTO	Co=58.9 μg cm^{-2}	0.5 M KPi	140	-	-	-	*Nat. Mater*., **2012**, 11, 802.
CoP/CC	0.92 mg cm^{-2}	1.0 M KPi	93	~200	~250	~380	*J. Am. Chem. Soc.*, **2014**, 136, 7587.
Co-NRCNT	0.280 mg cm^{-2}	0.1 M KPi	-	540	-	-	*Angew. Chem. Int. Ed.*, **2014**, 53, 4372
Cu/Cu_2O	-	0.5 M KPi	65	>300	-	-	*ACS Catal*. **2015**, 5, 4115.
FeP NAs/CC	1.5 mg cm^{-2}	1.0 M KPi	146	202	-	-	*ACS Catal.* **2014**, 4, 4065.
Cu_2MoS_4	0.042 mg cm^{-2}	0.1 M KPi	95	~350	-	-	*Energy Environ. Sci*., **2012**, 5, 8912
Mo_2B	~339 mg cm^{-2}	1.0 M KPi	-	>400	-	-	*Angew. Chem. Int. Ed.*, **2012**, 51, 12703
Mo_2C	~339 mg cm^{-2}	1.0 M KPi	-	>400	-	-	*Angew. Chem. Int. Ed.*, **2012**, 51, 12703
H_2-NiCat film	-	0.1 M NaBi	226	>600	-	-	*J. Phys. Chem. C*, **2014**, 118, 4578.
Ni-S film	Ni=81.5 μg cm^{-2}	1.0 M KPi	77	330	> 537	-	*J. Mater. Chem. A*, **2014**, 2, 19407.
$Fe_{1-x}S$	2.128 mg cm^{-2}	0.1 M KPi	150	>780	-	-	*ACS Catal.* **2014**, 4, 681.

[a] Overpotential required to reach current densities of 10, 50 or 100 mA cm^{-2}.