Electronic Supplementary Information (ESI) for

inorganic-MOF-inorganic approach to ultrathin CuO decorated Cu-C hybrid nanorod arrays for efficient oxygen evolution reaction

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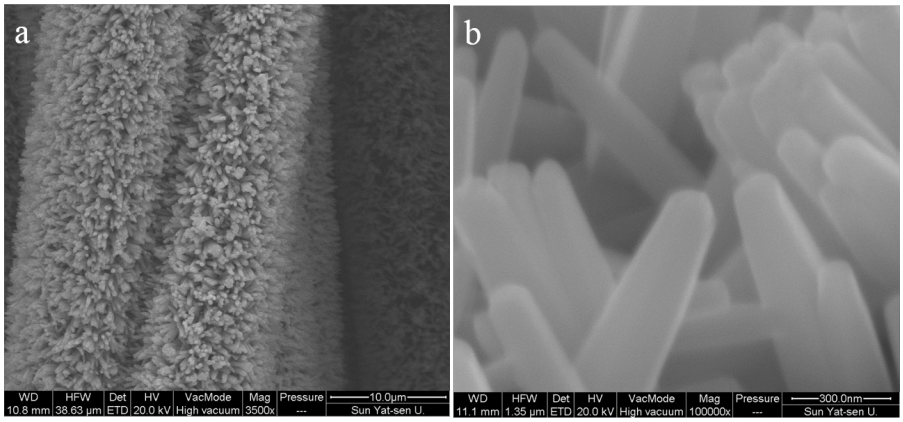

Fig. S1 (a), (b) SEM images of ZnO NRAs.

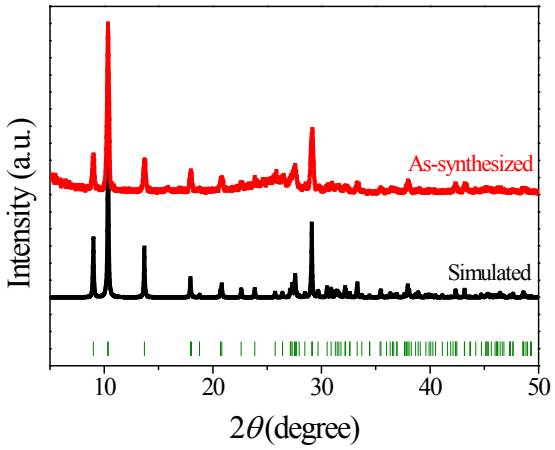

Fig. S2 PXRD patterns of CuMOF NRAs.

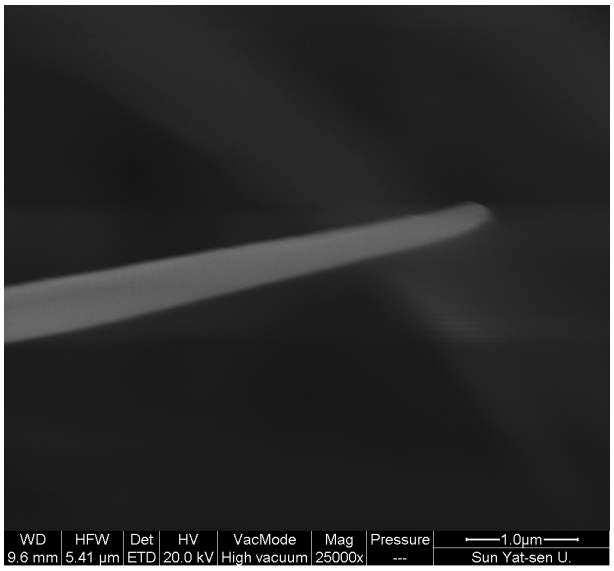

Fig. S3 SEM image of a single nanorod of CuMOF NRAs.

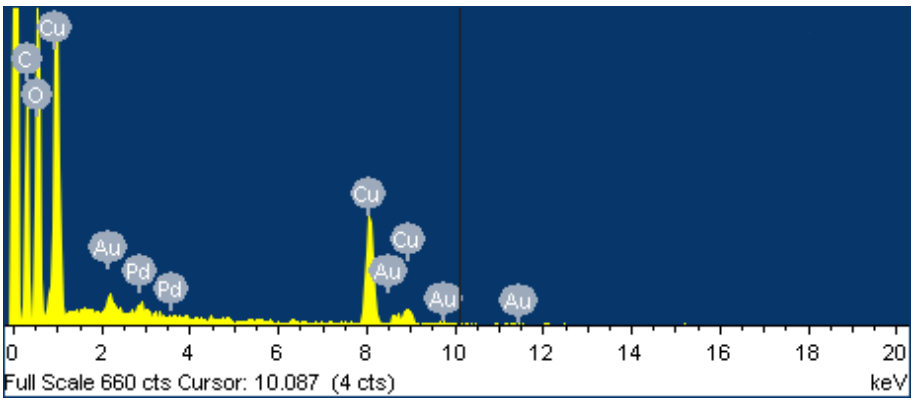

Fig. S4 EDS spectrum of CuMOF NRAs (Au, Pd from gold sputtering). This confirms the removal of Zn.

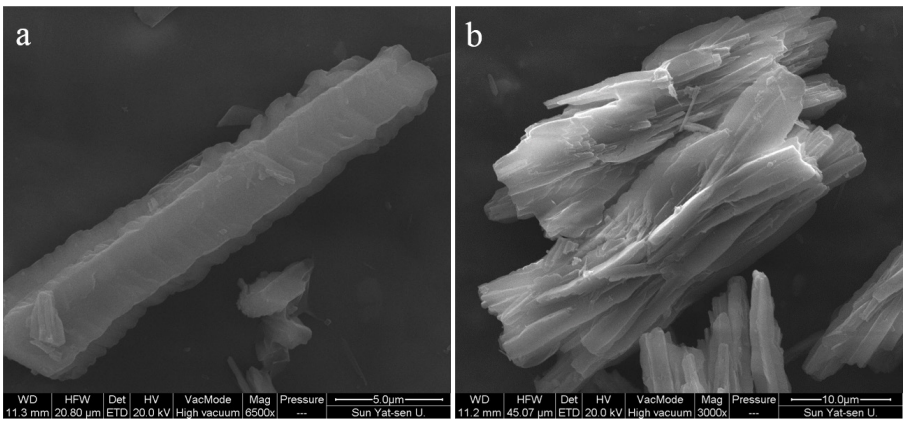

Fig. S5 (a), (b) SEM images of $[Cu_2(OH)(BTC)(H_2O)]$ crystals synthesized by direct hydrothermal synthesis.

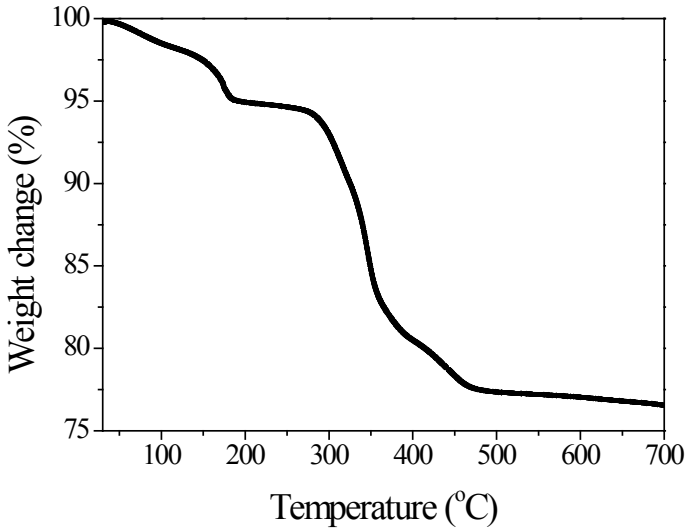

Fig. S6 TG curves of CuMOF NRAs (with the carbon cloth substrate) in N_2 atmosphere.

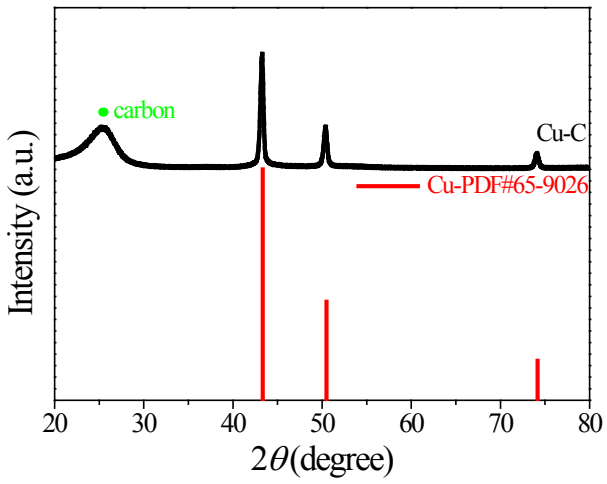

Fig. S7 PXRD patterns of Cu-C.

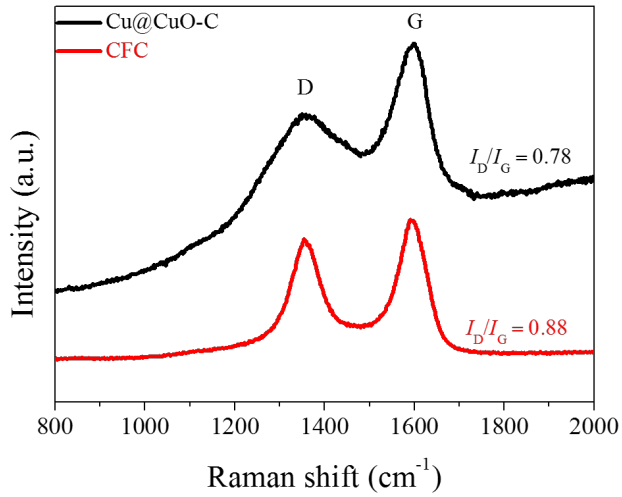

Fig. S8 Raman spectra for Cu@CuO-C and CFC.

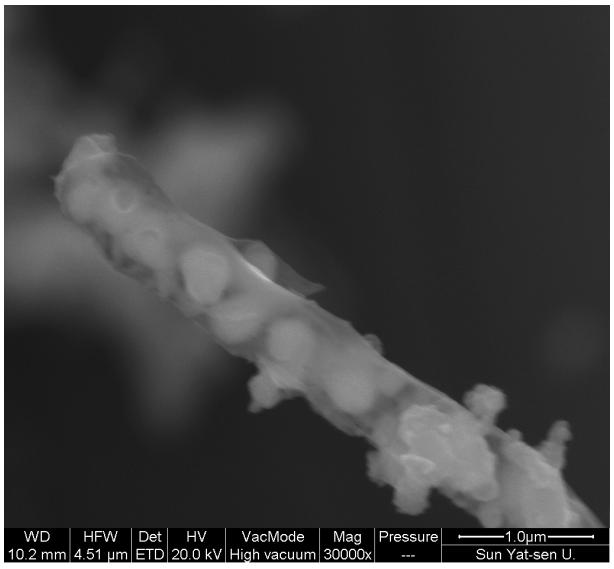

Fig. S9 SEM image of Cu@CuO-C-0.

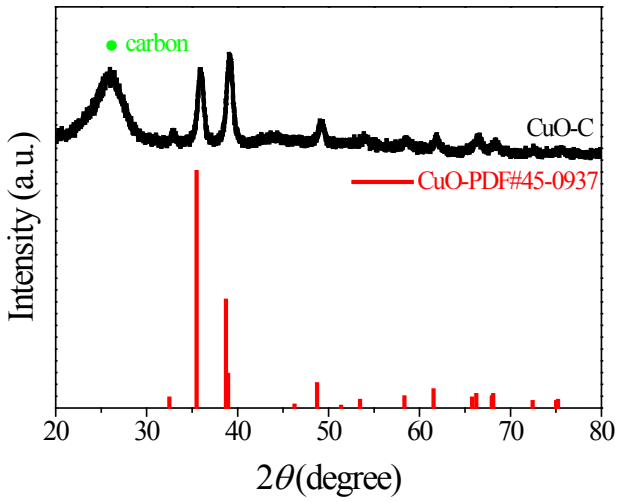

Fig. S10 PXRD patterns of CuO-C.

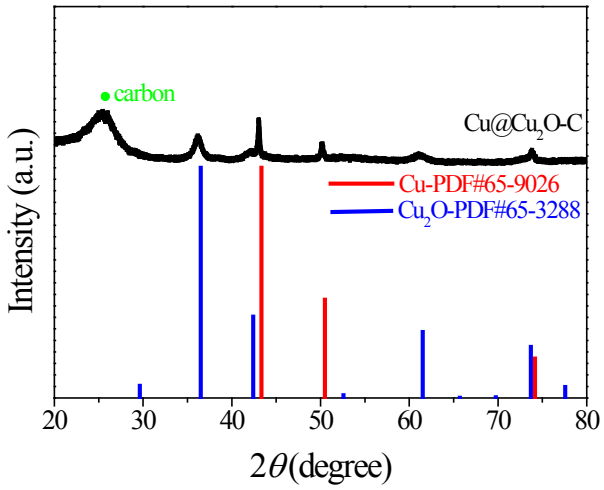

Fig. S11 PXRD patterns of Cu@Cu_2O-C.

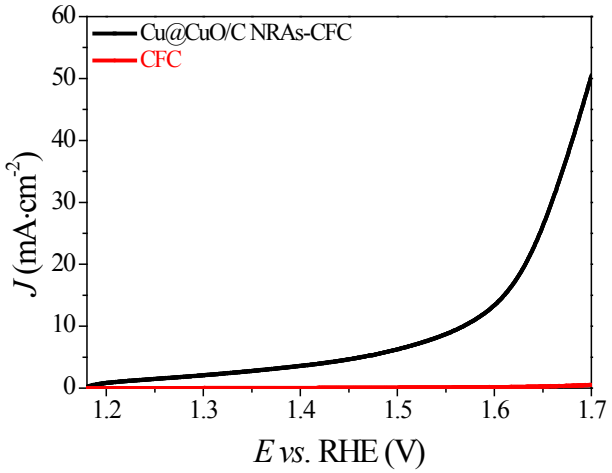

Fig. S12 LSV curves of Cu@CuO-C-0, and CFC in 1.0 M KOH.

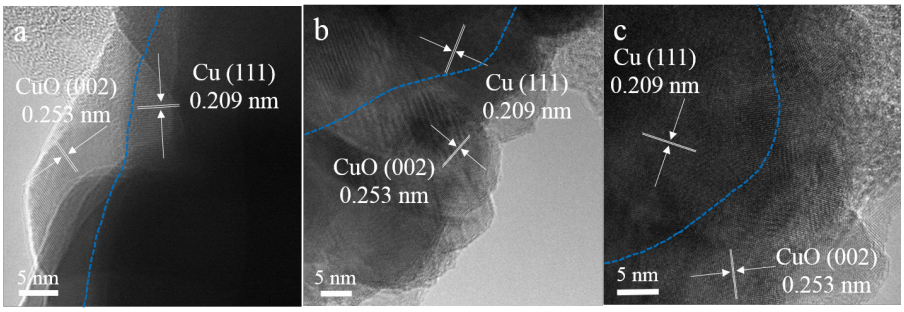

Fig. S13 HRTEM images of (a) Cu@CuO-C-5, (b) Cu@CuO-C-30, and (c) Cu@CuO-C-60 nanoparticles inlayed on the carbon surfaces. It can be seen that, the thickness of the CuO shell increases following the elongation of oxidation time.

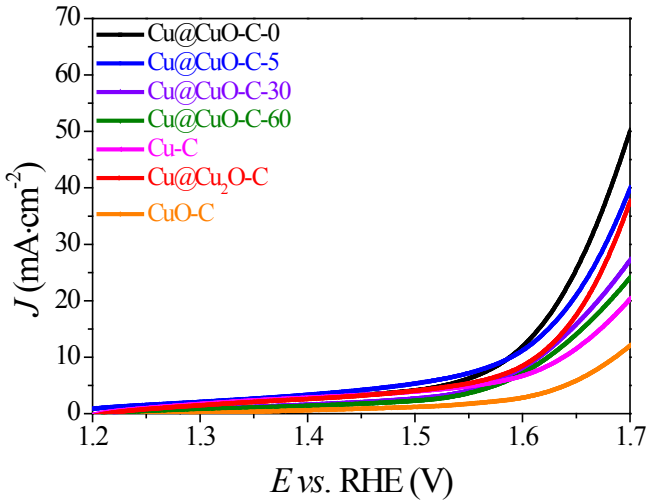

Fig. S14 LSV curves of Cu@CuO-C-0, Cu@CuO-C-5, Cu@CuO-C-30, Cu@CuO-C-60, Cu-C, Cu@Cu_2O-C and CuO-C in 1.0 M KOH.

Table S1. Comparisons of OER activity of some represented Cu-based OER catalysts reported in the literatures.

Catalysts	$E_{j=10}$ (V vs. RHE)	Electrolyte	Substrate	References
Cu@CuO-C-0	340 mV	1.0 M KOH	Carbon fiber cloth	This work
Cu@CuO-C-5	350 mV	1.0 M KOH	Carbon fiber cloth	This work
Cu@CuO-C-30	380 mV	1.0 M KOH	Carbon fiber cloth	This work
Cu@CuO-C-60	390 mV	1.0 M KOH	Carbon fiber cloth	This work
Cu-C	414 mV	1.0 M KOH	Carbon fiber cloth	This work
Cu@Cu_2O-C	390 mV	1.0 M KOH	Carbon fiber cloth	This work
CuO-C	456 mV	1.0 M KOH	Carbon fiber cloth	This work
Cu-N/graphene	~660 mV (5)	0.1 M KOH	Glassy carbon	*Nat. Commun.*, **2014**, *5*, 5285
CuO	~475 mV	1.0 M KOH	FTO	*Chem. Commun.*, **2016**, *52*, 5546
Cu/CuO nanowires	580 mV	1.0 M Na_2CO_3	Cu foil	*Angew. Chem. Int. Ed.*, **2015**, *54*, 2073
Cu/Cu_2O/CuO	290 mV	1M KOH	Cu plate	*Angew. Chem. Int. Ed.*, **2017**, *56*, 4792
Cu_2O	430 mV (0.1)	0.1 M borate solution	FTO	*Electrochim. Acta*, **2016**, *187*, 381
CuO nanowires	430 mV (0.1)	0.1 M KBi	FTO	*Electrochim. Acta*, **2015**, *160*, 202
Cu/($Cu(OH)_2$-CuO) nanorods array	417 mV	0.1 M KOH	Cu foil	*Electrochim. Acta*, **2015**, *163*, 102
CuO	430 mV (1)	pH 13.6	FTO	*J. Phys. Chem. C*, **2016**, *120*, 831
CuO	510 mV (1)	pH 9.2	Carbon cloth	*RSC Adv.*, **2016**, *6*, 77358
Cu nanoparticles	~480 mV	0.5 M KOH	platinum	*J. Mater. Chem. A,* **2013**, *1*, 4728
CuO film	780 mV (1)	pH 12.4	ITO	*Inorg. Chem.,* **2015**, *54*, 3061
Cu/Cu_2O nanocomposites	N. A.	0.5 M KOH	Glassy carbon	*Mater. Res. Bull.*, **2015**, *64*, 283
CuO film	530 mV (1)	pH 9	FTO	*ACS Catal.*, **2015**, *5*, 627
Cu_3P nanoarrys	412 mV (50)	0.1 M KOH	Cu foam	*ACS Appl. Mater. Interfaces*, **2016**, *8*, 23037
CuO	600 mV (1)	pH 9.2	FTO	*Electrochem. Commun.*, **2014**, *46*, 1
CuO_x-NLs	450 mV	pH 11	Cu foil	*ACS Catal.*, **2016**, *6*, 1768
CuO/Cu	470 mV (1.7)	0.1 M KOH	Carbon cloth	*ACS Catal.*, **2016**, *6*, 2473.
CuO	520 mV (2.5)	0.1 M KOH	Glassy carbon	*Catal. Sci. Technol.*, **2016**, *6*, 269
$Cu(OH)_2$ nanowire	530 mV	0.1 M KOH	Cu foil	*ChemSusChem*, **2016**, *9*, 2069
Cu/CuO-N/graphene	450 mV	1.0 M KOH	Glassy carbon	*ChemSusChem*, **2016**, *9*, 2365
Cu_2O-Cu foams	350 mV	1.0 M KOH	Cu foam	*ACS Catal.*, **2017**, *7*, 986
$Fe(OH)_3$:$Cu(OH)_2$ nanowire	~365 mV	1.0 M KOH	Cu foam	*Chem. Commun.*, **2016**, *52*, 14470
Cu_3P nanobush/Cu	380 mV	1.0 M KOH	Cu mesh	*ACS Omega*, **2016**, *1*, 1367
Cu_3P microsheets	290 mV	1.0 M KOH	Ni foam	*Adv. Mater. Interfaces*, **2016**, *3*, 1600236
Cu_3P/CuO	320 mV	1.0 M KOH	Ni foam	*ACS Appl. Mater. Interfaces*, **2017**, *9*, 2240