

## Electronic Supplementary Information

### **A novel multi-walled carbon nanotubes-coupled CoNi MOFs composites enhance oxygen evolution reaction through the synergistic effect**

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Electronic Supplementary Information (ESI) available: Materials and reagents and Additional characterization results.

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## Experimental section

**Materials.** All chemicals were commercially available and used without further purification. Nickel nitrate hexahydrate ( $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  99%) purchased from Tianjin boke chemical company, Cobalt nitrate hexahydrate ( $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  99%) bought from big alum chemical reagent factory in Tianjin, 2-amino terephthalic acid  $\text{NH}_2\text{BDC}$  bought ( $\text{C}_8\text{H}_7\text{NO}_4$ , 98%) from Michael Lin company, bought carbon nanotubes mCNTs from Shenzhen China's leading technology companies, analysis level DMF (dimethylformamide) purchased from Tianjin fu yu fine chemical Co. Ltd, bought anhydrous ethanol from Tianjin fu yu chemical Co., Ltd.

All reagents and compounds needed for the synthesis of materials are pure and can be used without additional processing. The chemicals required were Nickel nitrate hexahydrate ( $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ ), Cobalt nitrate hexahydrate ( $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ ), 2-aminoterephthalic acid ( $\text{NH}_2\text{BDC}$ ) and carbon nanotubes (CNTs) purchased from Micron while the analytical grade DMF was obtained from Tianjin Fuyu.

## Characterizations

Scanning electron microscope (SEM) was used to comprehensively detect the external texture of the sample; Samples with Cu K $\alpha$  ( $\lambda=0.154$  nm) radiation of X-ray powder diffraction (XRD) analysis of the composition of the sample, the internal structure of atoms and molecules; scan conditions for  $5^\circ$ - $80^\circ$  ( $2\theta$  range), 5 mA and 20 kV, frequency of  $10^\circ/\text{min}$  analysis; The coordination functional groups of the materials were determined by Fourier transform infrared spectroscopy (FT-IR) in the wavenumber range ( $4000$ - $500\text{cm}^{-1}$ ). The elemental content and composition of the samples, the

oxidation state and binding energy of the constituent elements were analyzed by energy-dispersive X-ray diffraction (EDS) and probe X-ray photoelectron spectroscopy (XPS) respectively; N<sub>2</sub> adsorption/desorption isotherms were measured using a Micromeritics ASAP2020 system at 77 K.

## **Electrochemical measurements**

### **“Calculation of ECSA.”**

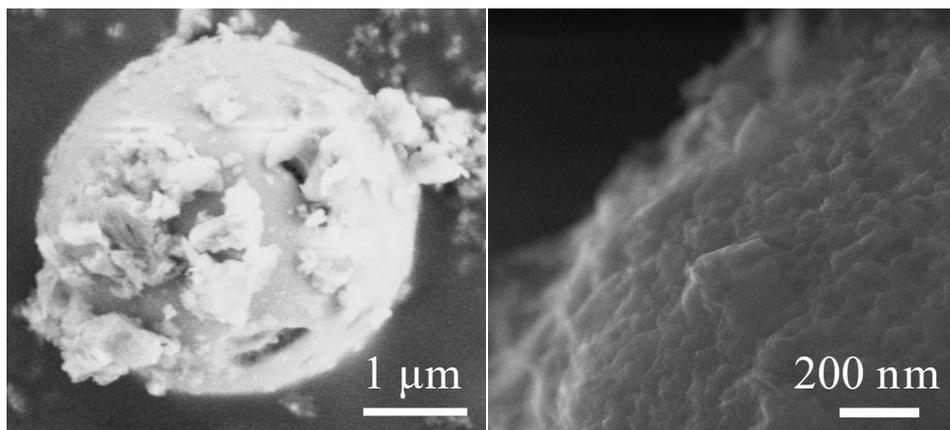
The electrochemical double-layer capacitances ( $C_{dl}$ ) of the electrocatalysts are obtained based on the equation:

$$C_{dl} = \frac{i}{k}$$

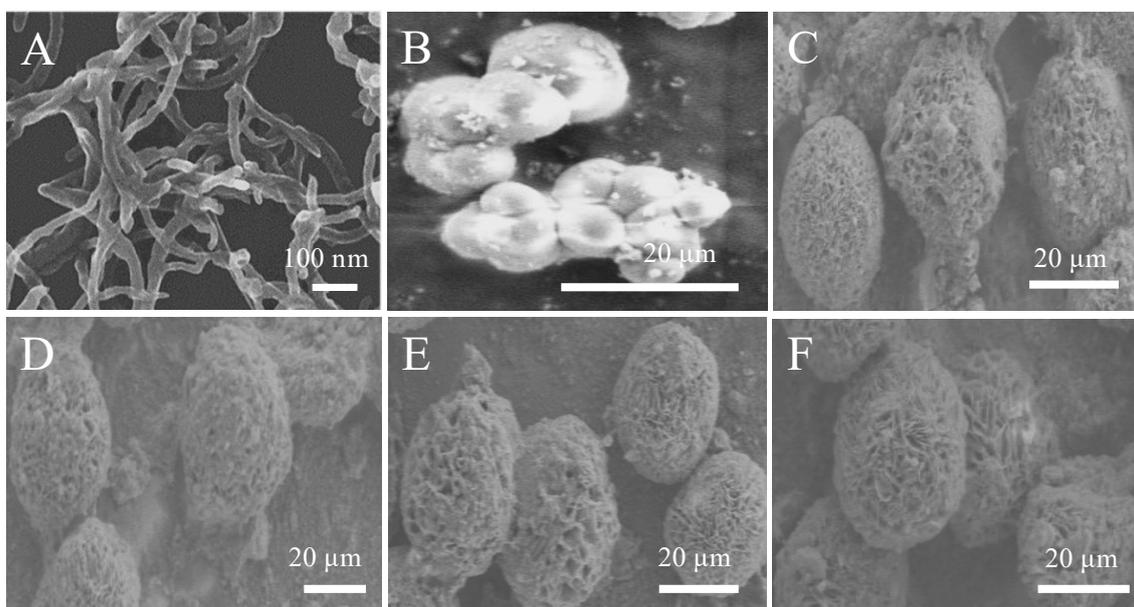
Where K is the scan rate.

ECSA is calculated by assuming a standard value of 27 uF cm<sup>-2</sup>

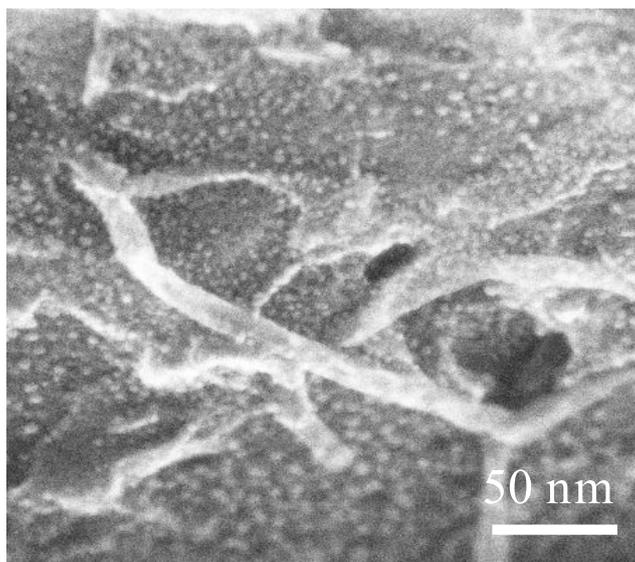
$$ECSA = \frac{C_{dl}}{27}$$



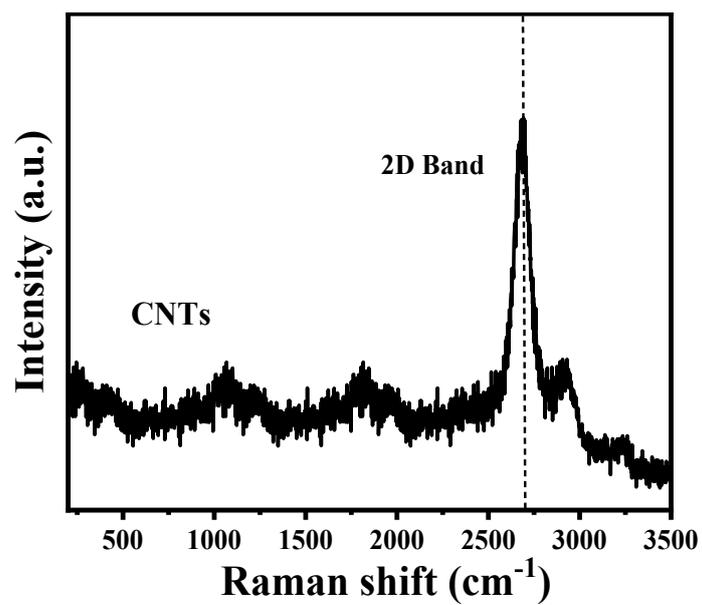
**Fig. S1.** SEM images of CoNi MOFs.



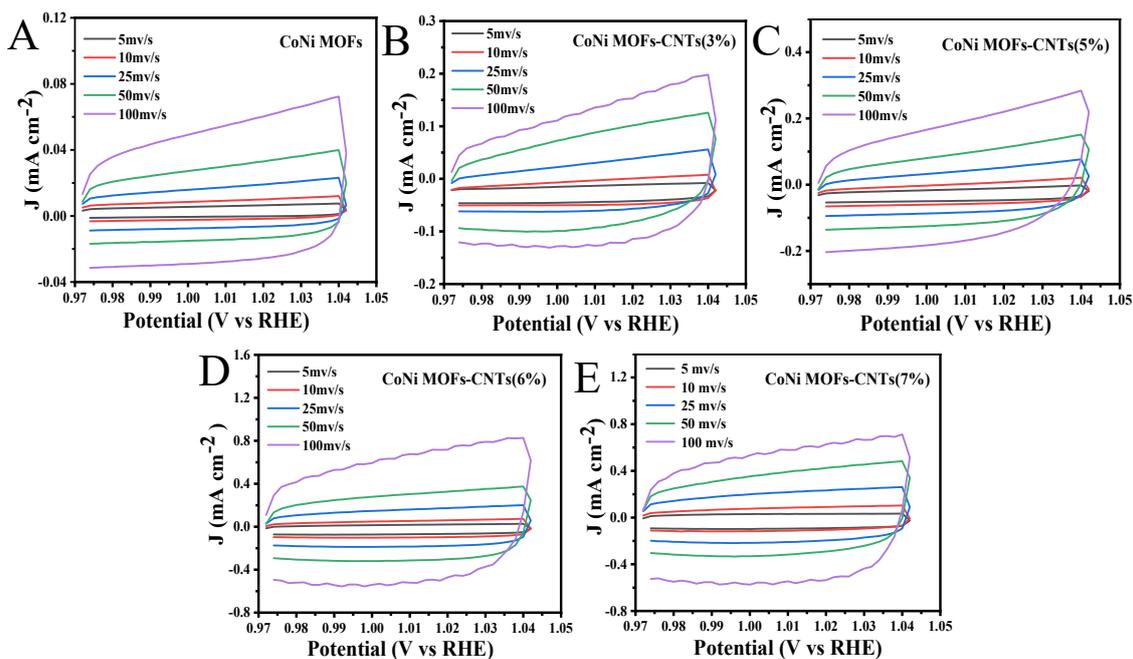
**Fig. S2.** SEM images of (A) mCNTs and (B-F) CoNi MOFs and CoNi MOFs-mCNTs (3, 5, 6, 7 wt%) composites.



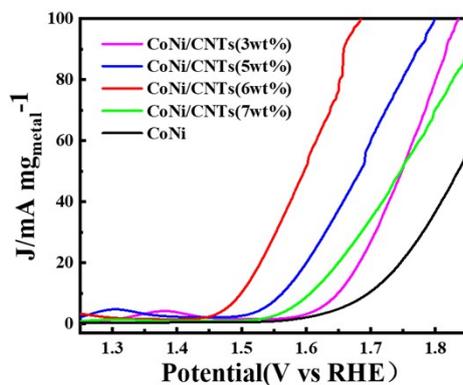
**Fig. S3.** SEM images of CoNi MOFs-mCNTs.



**Fig. S4.** Raman spectra of mCNTs.



**Fig. S5.** CV curves were collected on (A) CoNi MOFs and (B-E) CoNi MOFs-mCNTs at different scan rates from 5 to 100 mV s<sup>-1</sup>.



**Fig. S6.** LSV curves of as-prepared samples normalized by metal mass.