*In-situ* Surface Self-Reconstruction in Ternary Transition Metal Dichalcogenide Nanorod Arrays Enables Efficient Electrocatalytic Oxygen Evolution

Qiang Chena,b, Yulu Fua,b, Jialun Jina, Wenjie Zangb, Xiong Liua, Xiangyong Zhangb, Wenzhong Huanga, Zongkui Koub,\*, John Wangb, Liang Zhoua,c\*, Liqiang Maia,c\*

*aState Key Laboratory of Advanced Technology for Materials Synthesis and Processing, Wuhan University of Technology, Wuhan 430070, China*

*bDepartment of Materials Science and Engineering,* *National University of Singapore, Singapore 117574, Singapore*

*cFoshan Xianhu Laboratory, Foshan 528216, Guangdong, China*

\*Corresponding authors.

*E-mail address:* mlq518@whut.edu.cn (L. Mai);

liangzhou@whut.edu.cn (L. Zhou);

msekz@nus.edu.sg (Z. Kou)

Experimental Section

*Catalyst synthesis*

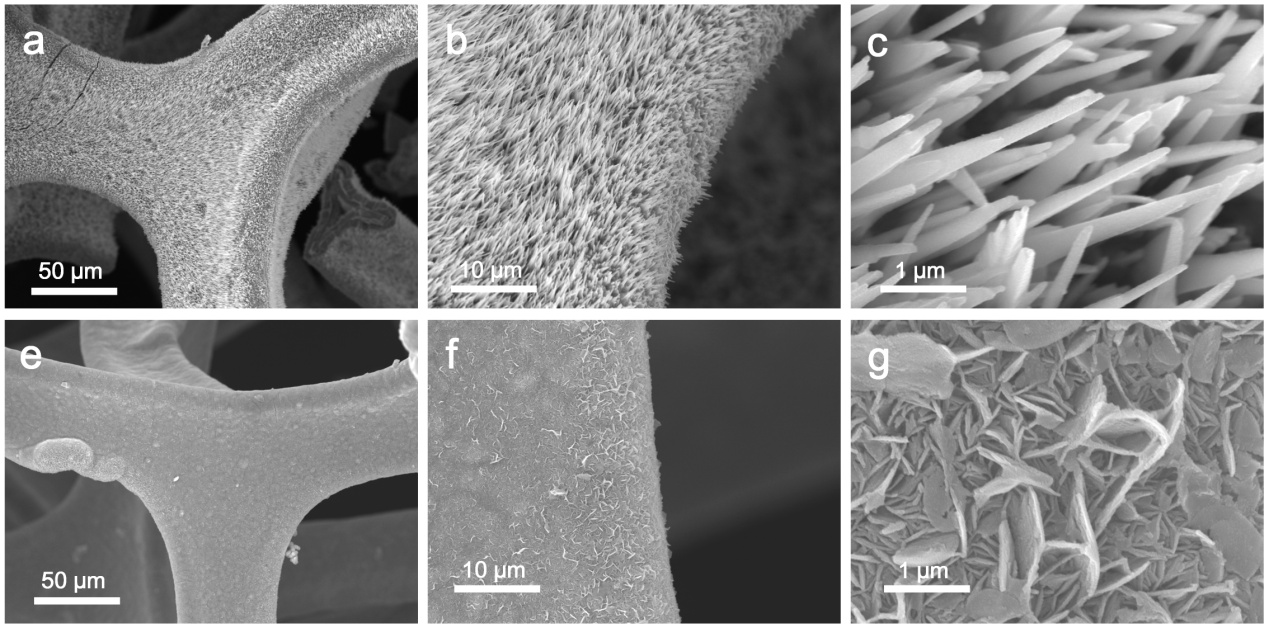
The FCND on NF was synthesized by a one-step hydrothermal method. The clean Ni foam (2.0 cm × 3.0 cm) was put into a solution (40 mL) including 1 mmol FeSO4·7H2O, 1 mmol Co(NO3)2·6H2O, 3.5 g Na2S, 0.1 g urea and 0.04 g Na3C6H5O7∙2H2O, and then transferred into a Teflon-lined stainless steel autoclave. After heating 12 h at 160 oC, the sample was taken out and cleaned with deionized water and dried. The ND, FND, and CND electrode materials were also prepared by the same method, but with different amounts of FeSO4·7H2O, Co(NO3)2·6H2O. The preparation of ND electrode materials does not require the addition of FeSO4·7H2O and Co(NO3)2·6H2O. The preparation of FND electrode materials only needs to add 1 mmol of FeSO4·7H2O. The preparation of CND electrode materials only requires the addition of 1 mmol of Co(NO3)2·6H2O.

*Material characterizations*

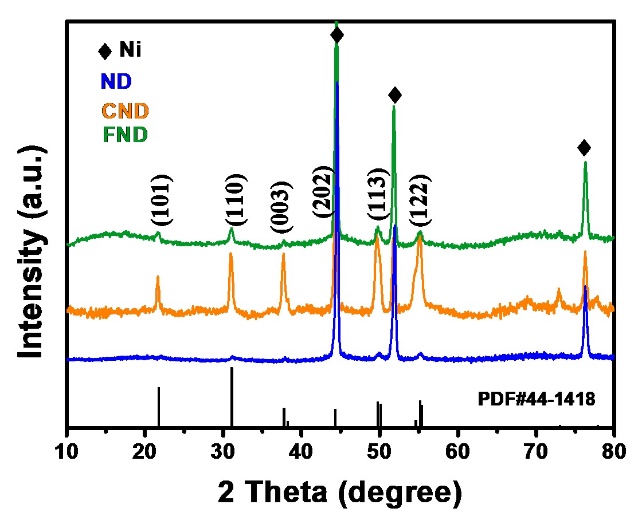
The catalysts structure and compositions were measured with X-ray diffraction (XRD, Bruker D8). The field emission scanning electron microscopy (FE-SEM, JEOL-7100F) and transmission electron microscopy (TEM, JEM-2100F) were recorded on surface morphologies of catalysts. The valence states of elements of the samples were measured by an X-ray photoelectron spectroscopy (XPS, VG MultiLAB 2000). The Raman measurements were recorded using a HORIBA HR EVO Raman system (633 nm laser) and an electrochemical workstation (CHI 760D). The potential-dependent *in-situ* Raman spectra were recorded with interval potential of 25 mV and meanwhile the LSV measurements were carried out at 1.1-1.6 V and 0.25 mV s-1 in 1.0 M KOH.

*Electrochemical measurements*

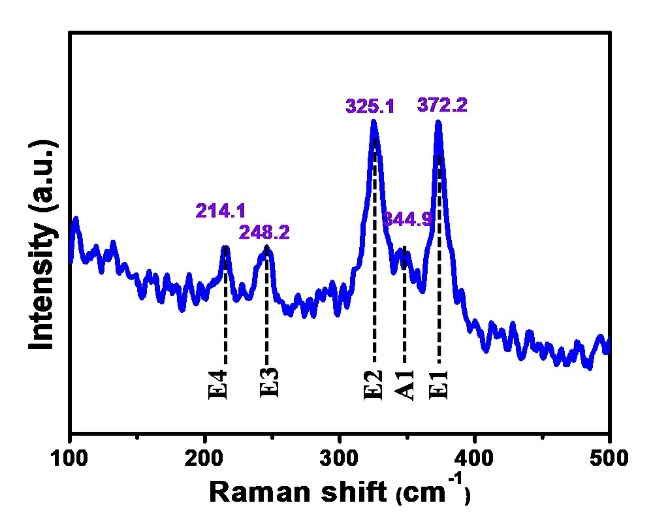
Electrochemical measurements were made at an electrochemical workstation (CHI 760D). The electrocatalytic performance of FCND was studied in a three-electrode system in 1.0 M KOH. A Hg/HgCl (saturated KCl) electrode and a carbon rod were used as the reference electrode and counter electrode, respectively. The calibration of the reversible hydrogen electrode (RHE) potential is as follows: E vs. RHE = measured value (*vs.* Hg/HgCl) + 0.2412 + 0.0591 pH. For comparison, the electrocatalytic activities of NF, ND, FND, CND, and IrO2/C electrode were also tested under the same conditions.



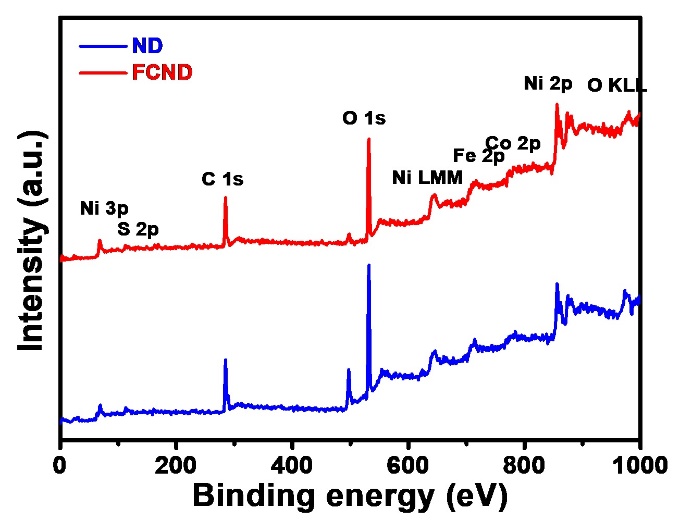
**Fig. S1.** SEM images of CND nanorods (a-c) and FND nanosheets (e-g) at different magnification.



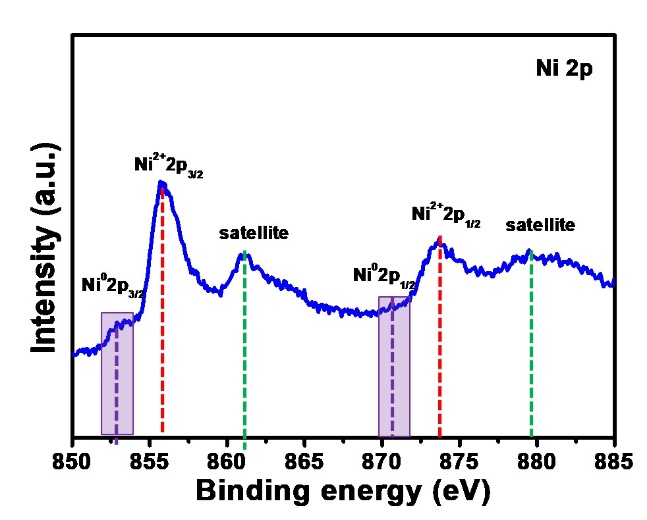
**Fig. S2.** XRD patterns of ND, CND, and FND.



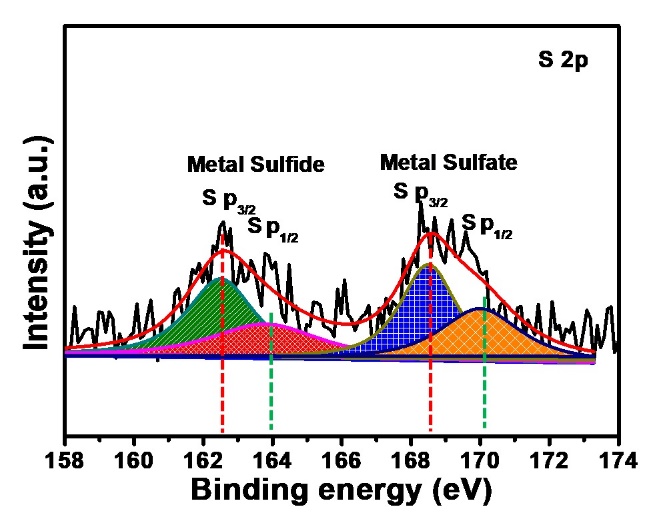
**Fig. S3**. Raman spectra of ND.



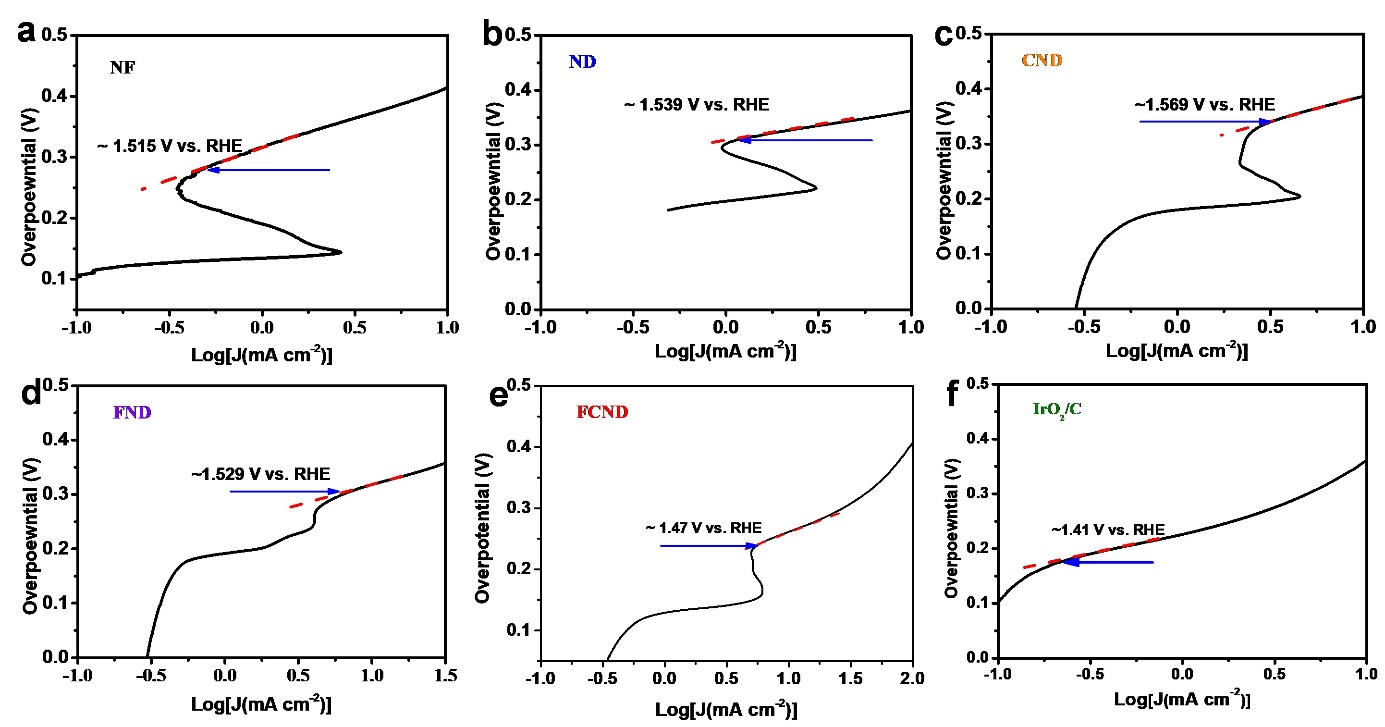
**Fig. S4.** XPS survey peaks of ND and FCND.



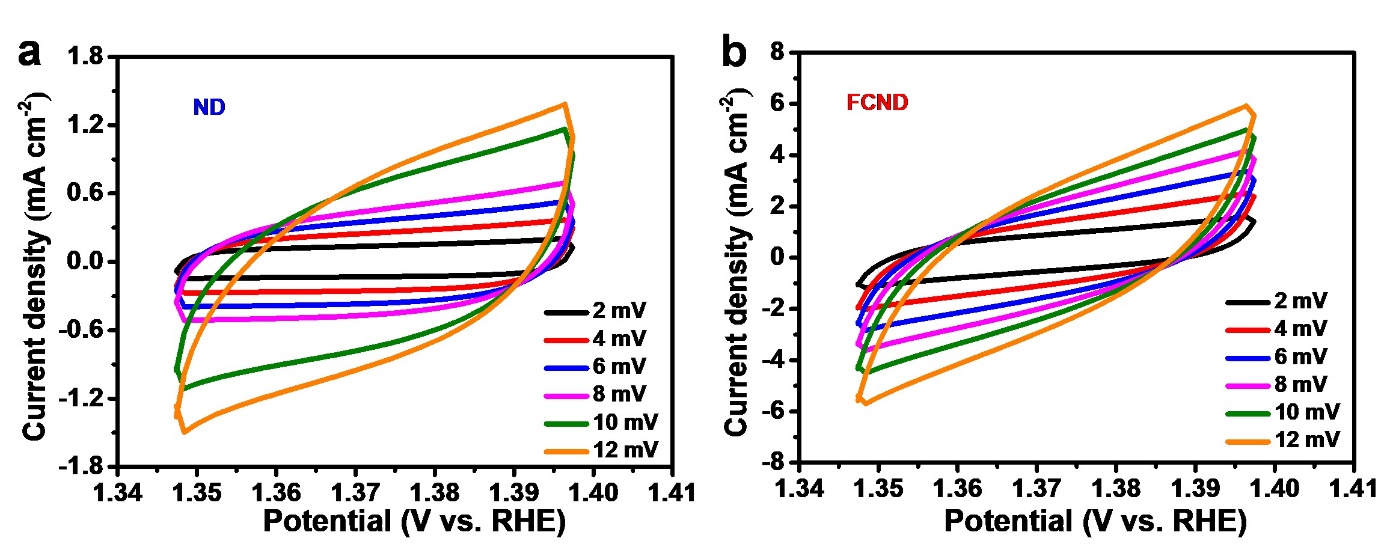
**Fig. S5.** Ni 2p XPS spectra of ND.



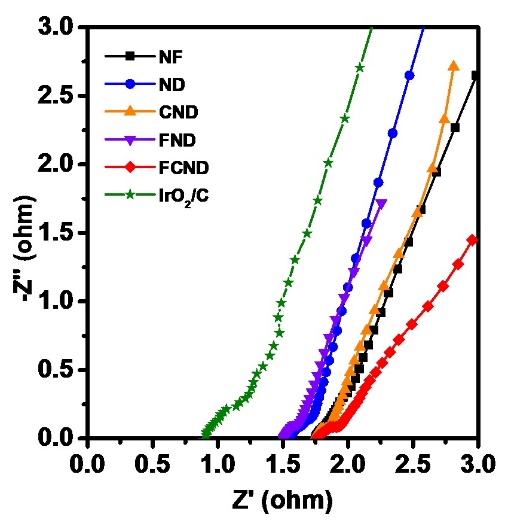
**Fig. S6.** S 2p XPS spectra of ND.



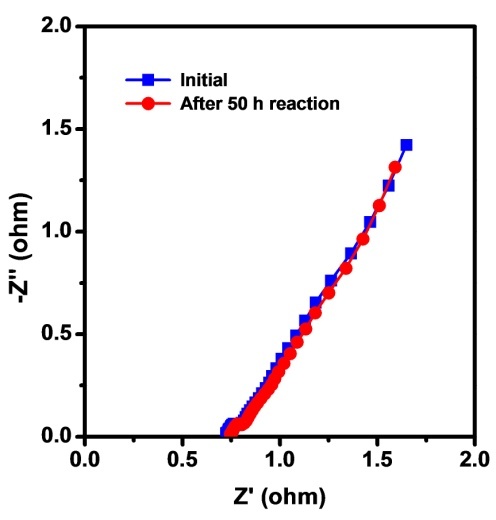
**Fig. S7**. Onset potential of (a) NF, (b) ND, (c) CND, (d) FND, (e) FCND, and (f) IrO2/C electrodes in 1.0 M KOH solution.

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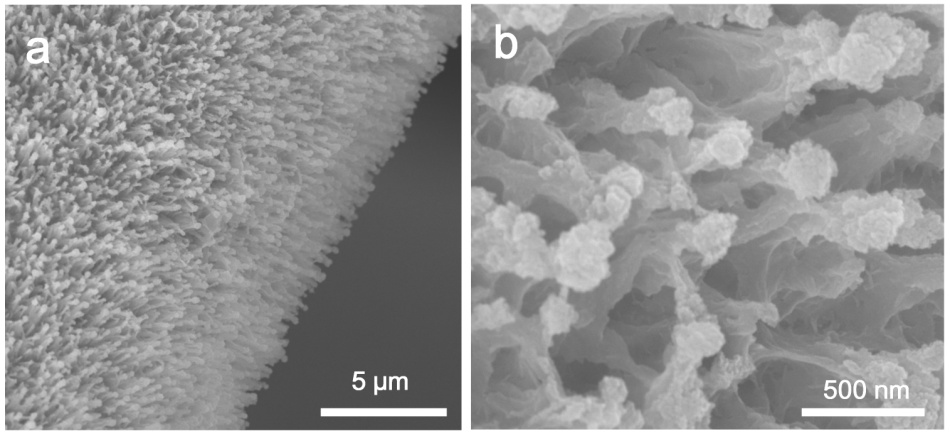
**Fig. S8.** Cyclic voltammograms curves in the double layer region at scan rate of 2, 4, 6, 8 10, 12 mV s-1 (along the arrow direction) of (a) ND and (b) FCND.



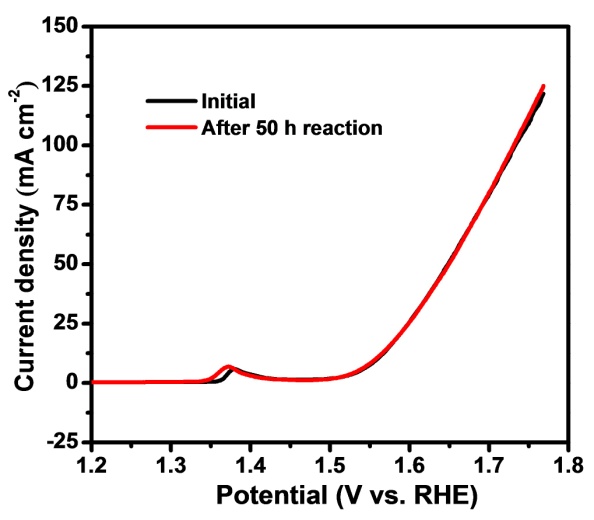
**Fig. S9.** Nyquist plots of NF, ND, and CND, FND, FCND, and IrO2/C electrodes.



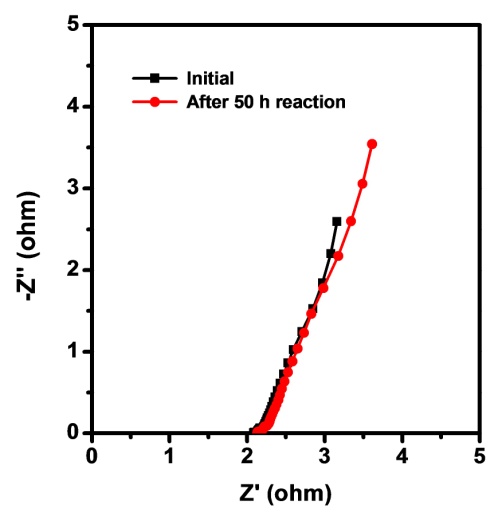
**Fig. S10.** Nyquist plots of FCND electrodes before and after 50 h reaction.



**Fig. S11.** SEM image of FCND nanorods at different magnification after 50 h reaction.



**Fig. S12.** The LSV curves of ND before and after 50 h reaction.



**Fig. S13.** Nyquist plots of ND electrodes before and after 50 h reaction.