Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supplementary Information

Lattice-disorder layer generation from liquid processing at room temperature with boosted nanointerface exposure toward water splitting

Hui Han,[a] Yanling Qiu,[a] Hui Zhang,[a] Tianyi Bi,[a] Qian Yang,[a] Mengyao Liu,[a] Jian Zhou[b,*] and Xuqiang Ji[a,*]

[a]College of Materials Science and Engineering, Institute for Graphene Applied Technology Innovation, Qingdao University, Qingdao 266071, China

[b] School of Electromechanic Engineering , Qingdao University, Qingdao 266071, China.

*Corresponding Author. E-Mail: zhoujian@qdu.edu.cn; xuqianglucky@163.com

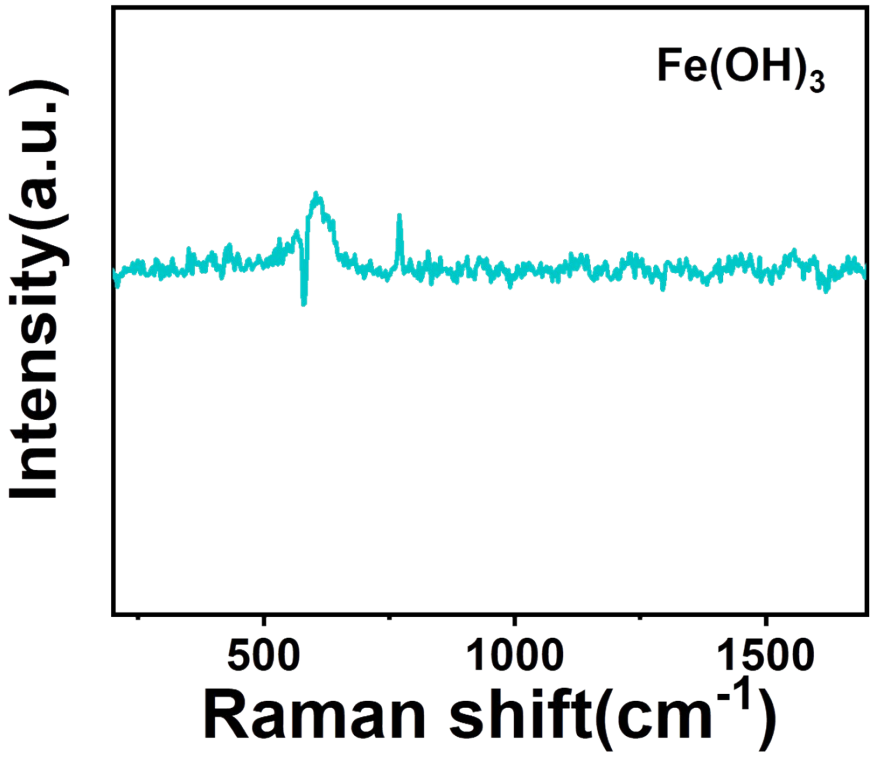

Fig. S1 The Raman spectrum of NCF-2.

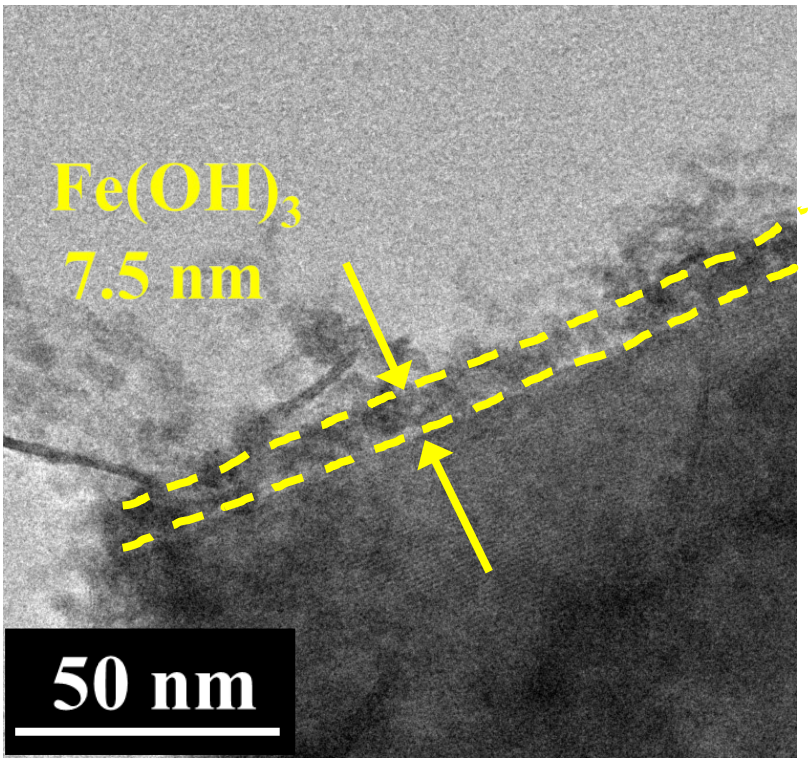

Fig. S2 The TEM images for NCF-2.

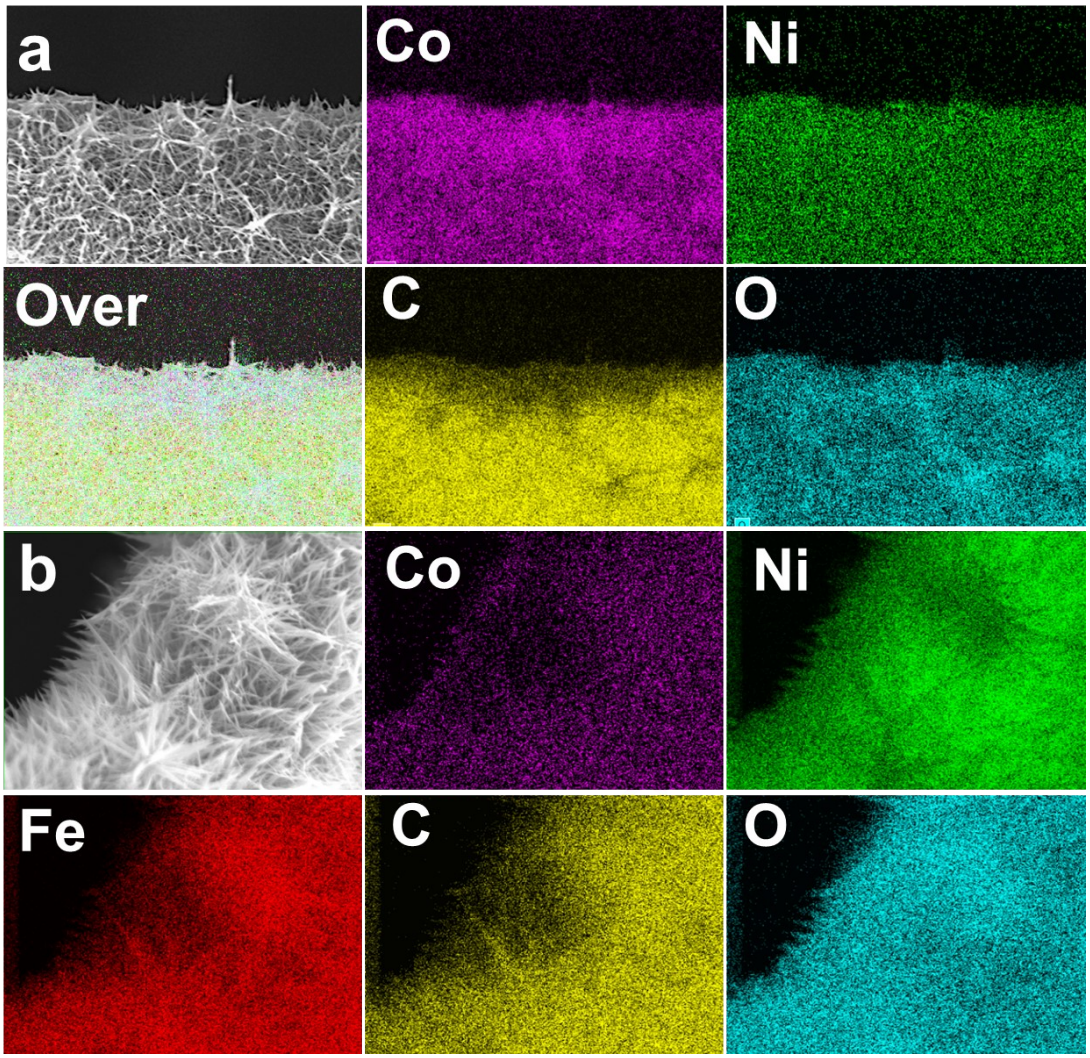

Fig. S3 The SEM images and EDS elemental mapping images for (a) NiCoCH of Co, Ni, C and O, for (b) NCF-1 of Co, Ni, Fe, C and O.

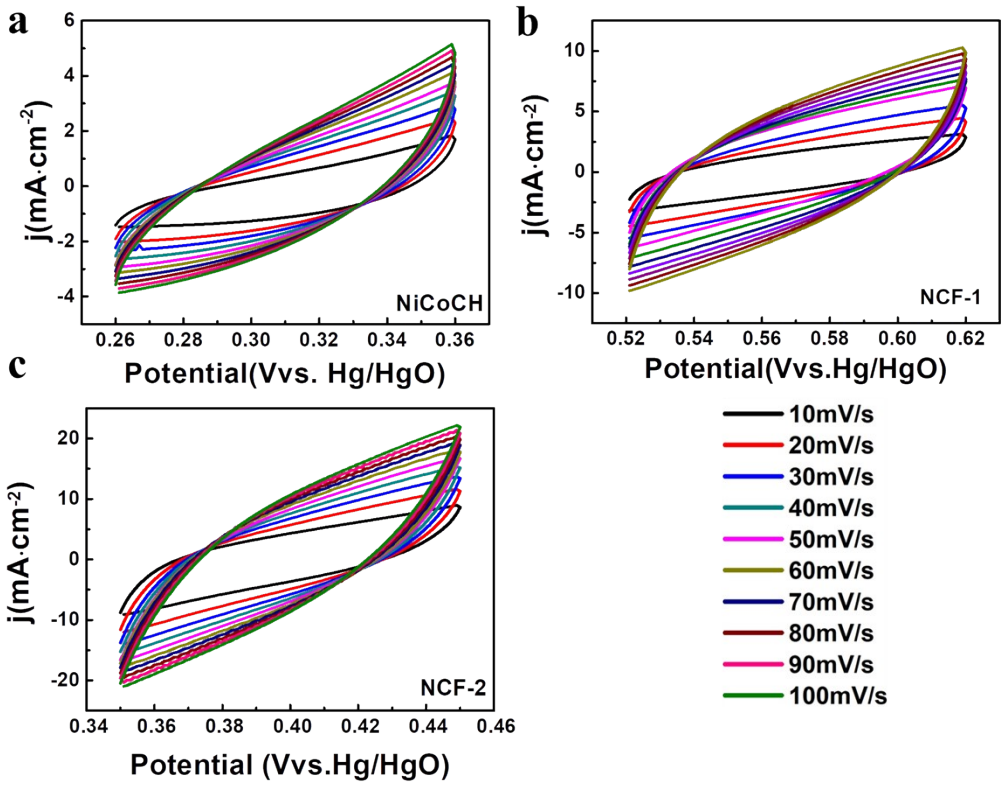

Fig. S4 The CVs for (a) NiCoCH, (b) NCF-1, (c) NCF-2.

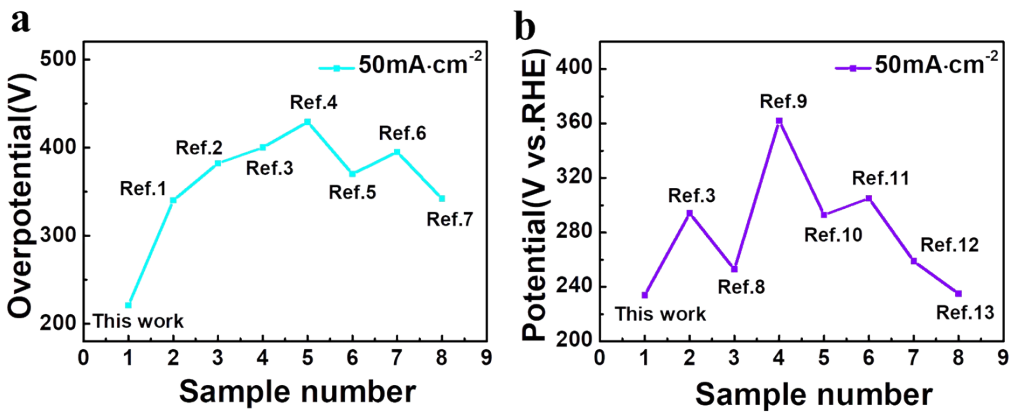

Fig. S5 Comparison of NCF-2 in 1.0 M KOH with the catalytic performance of other recently reported electrocatalysts of (a) OER and (b) HER catalytic performance.

References

[1] P. Zhang, X. Lu, J. Nai, S. Q. Zang and X. Lou, Construction of Hierarchical Co-Fe Oxyphosphide Microtubes for Electrocatalytic Overall Water Splitting. *Adv. Sci.,* 2019, **6**, 1900576.

[2] B. You, N. Jiang, M. Sheng, S. Gul, J. Yano and Y. Sun, High-Performance Overall Water Splitting Electrocatalysts Derived from Cobalt-Based Metal-Organic Frameworks. *Chem. Mater.,* 2015, **27**, 7636-7642.

[3] S. Yoon, J. Kim, J. H. Lim and B. Yoo, Cobalt Iron-Phosphorus Synthesized by Electrodeposition as Highly Active and Stable Bifunctional Catalyst for Full Water Splitting. *J. Electrochem. Soc.,* 2018, **165**, H271-H276.

[4] L. Jiao, Y. X. Zhou, H. L. Jiang, Metal-Organic Framework-Based CoP/Reduced Rraphene Oxide: High-Performance Bifunctional Electrocatalyst for Overall Eater Splitting. *Chem. Sci.,* 2016, **7**, 1690-1695.

[5] J. Wang, W. Yang, J. Liu, CoP_2 Nanoparticles on Reduced Graphene Oxide Sheets as a Super-Efficient Bifunctional Electrocatalyst for Full Water Splitting. *J. Mater. Chem. A,* 2016, **4**, 4686-4690.

[6] N. Jiang, B. You, M. Sheng and Y. Sun, Electrodeposited Cobalt-Phosphorous-

Derived Films as Competent Bifunctional Catalysts for Overall Water Splitting. *Angew. Chem. Int. Ed.,* 2015, **54**, 6251-6254.

[7] L. Fang, W. Li, Y. Guan, Y. Feng, H. Zhang, S. Wang and Y. Wang, Tuning Unique Peapod-Like $Co(S_xSe_{1-x})_{(2)}$ Nanoparticles for Efficient Overall Water Splitting. *Adv. Funct. Mater.,* 2017, **27**, 1701008.

[8] Q. Yuan, Y. Yu, P. C. Sherrell, J. Chen and X. Bi, Fe/Co-Based Bimetallic MOF-derived Co_3Fe_7@NCNTFs Bifunctional Electrocatalyst for High-Efficiency Overall Water Splitting. *Chem Asian J,* 2020, **15**, 1728-1735.

[9] C. B. Ouyang, X. Wang, C. Wang, X. Zhang, J. Wu, Z. Ma, S. Dou and S. Wang, Hierarchically Porous Ni_3S_2 Nanorod Array Foam as Highly Efficient Electrocatalyst for Hydrogen Evolution Reaction and Oxygen Evolution Reaction. *Electrochim. Acta,* 2015, **174**, 297-301.

[10] N. Yang, C. Tang, K. Wang, G. Du, A. M. Asiri and X. Sun, Iron-Doped Nickel Disulfide Nanoarray: A Highly Efficient and Stable Electrocatalyst for Water Splitting. *Nano Res.,* 2016, **9**, 3346-3354.

[11] Y. Liang, Q. Liu, Y. Luo, X. Sun, Y. He and A. M. Asiri, $Zn_{0.76}Co_{0.24}S/CoS_2$ Nanowires Array for Efficient Electrochemical Splitting of Water. *Electrochim. Acta,* 2016, **190**, 360-364.

[12] D. Liu, Q. Lu, Y. Luo, X. Sun and A. M. Asiri, $NiCo_2S_4$ Nanowires Array as an Efficient Bifunctional Electrocatalyst for Full Water Splitting with Superior Activity. *Nanoscale,* 2015, **7**, 15122-15126.

[13] L. Yang, H. Qi, C. Zhang and X. Sun, An Efficient Bifunctional Electrocatalyst for Water Splitting Based on Cobalt Phosphide. *Nanotechnology,* 2016, **27**, 23LT01.