

Supporting Information

MOF-derived Hollow $\text{Co}_4\text{S}_3/\text{C}$ Nanosheet Arrays Grown on Carbon Cloth as Anode for high-performance Li-ion Batteries

Mingchen Shi^{+a}, Qiang Wang^{+a}, Junwei Hao^a, Huihua Min^b, Hairui You^a, Xiaomin Liu^{*a} and Hui Yang^{*a}

a College of Materials Science and Engineering, Nanjing Tech University, Nanjing, Jiangsu, China.

Email Liuxm@njtech.edu.cn, yanghui@njtech.edu.cn

b. Electron Microscope Lab, Nanjing Forestry University, Nanjing, Jiangsu, China.

+ These authors contributed equally to this work

* *Corresponding author.*

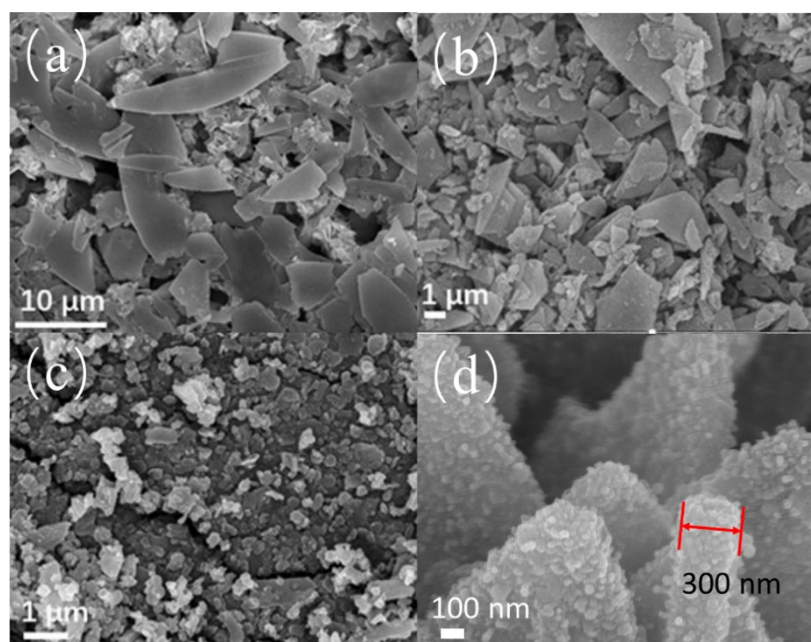
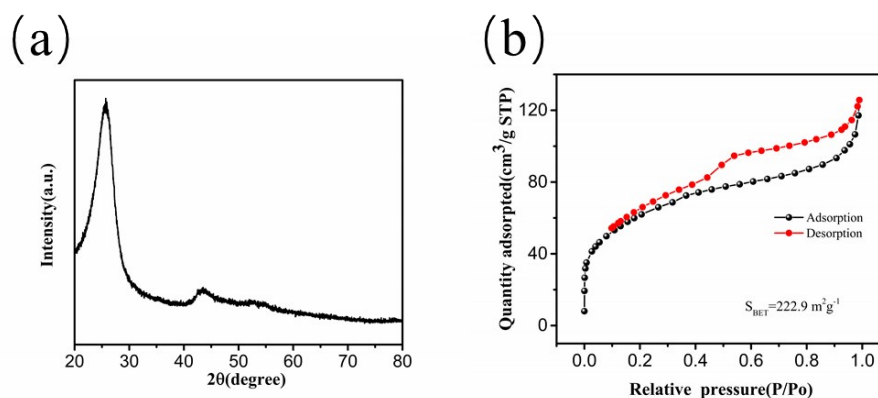


Fig. S1 (a-c) SEM images of Co-MOF, Co/C, $\text{Co}_4\text{S}_3/\text{C}$ (d) high-magnification SEM of h- $\text{Co}_4\text{S}_3/\text{C}$ NA@CC



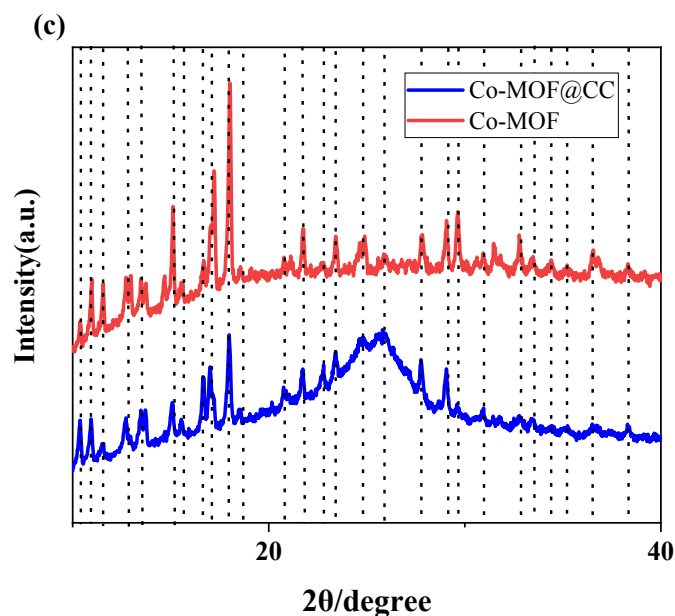


Fig. S2 (a) XRD pattern of carbon cloth (b) Nitrogen adsorption and desorption curve of $\text{Co}_4\text{S}_3/\text{C}$ (c) Contrast between Co-MOF@CC and Co-MOF.

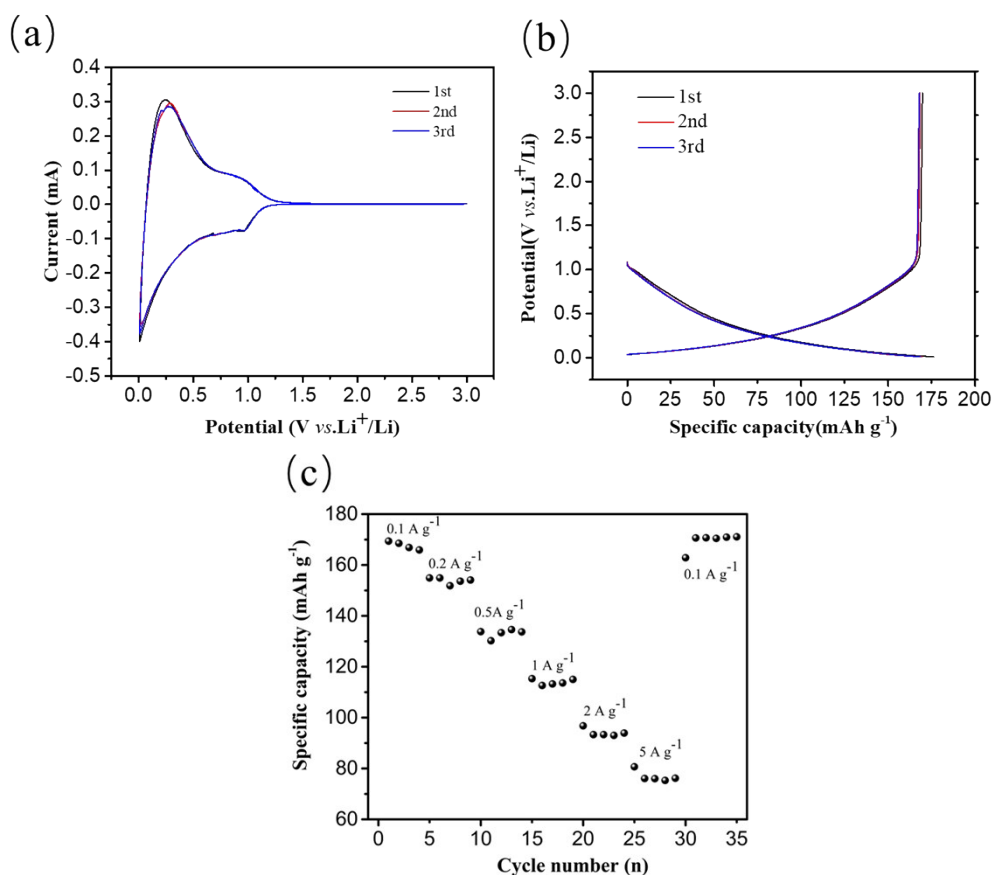


Fig. S3 (a) CV curves of bare CC anode at the scan rate of 0.1 mV s^{-1} between 0.01 and 3.0 V (b) Lithiation and delithiation voltage profiles of bare CC anode at the current density of 0.1 A g^{-1} for the first three cycles (c) The rate capability of bare CC anode

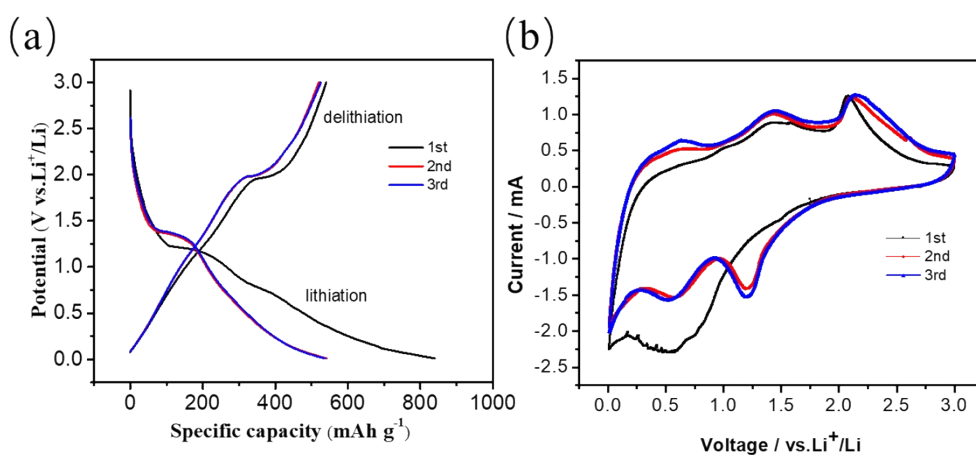


Fig. S4 (a) Lithiation and delithiation voltage profiles of bare $\text{Co}_4\text{S}_3/\text{C}$ anode at the current density of 0.1 A g^{-1} for the first three cycles (b) CV curves of bare $\text{Co}_4\text{S}_3/\text{C}$ anode at the scan rate of 0.2 mV s^{-1} between 0.01 and 3.0 V

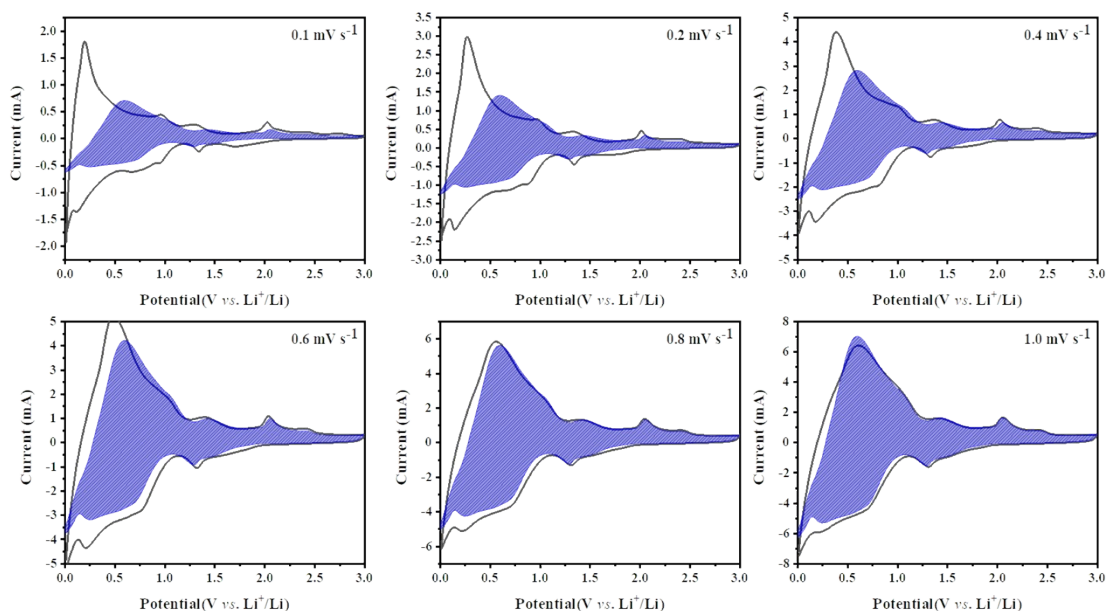


Fig. S5 Capacitive charge storage contribution of $\text{h-Co}_4\text{S}_3/\text{C NA@CC}$ anode at different scan rates (shaded region)

Table S1. Comparison of electrochemical properties of various CoS-based composite anode

Material	Current density (mA g ⁻¹)	Capacity (mAh g ⁻¹)	Cycle number	Refence
Co _{1-x} S/NCS	200	796.3	100 th	1
CoS _x hollow spheres	500	1012.1	100 th	2
CoS _x /RGO	100	796	50 th	3
CoS ₂ -NF/rGO-NS	500	769	200 th	4
Co ₃ S ₄ @C@MoS ₂	200	672.6	200 th	5
lantern-like CoS hierarchitectures	1000/100	352/477	1000 th /400 th	6
h-Co ₄ S ₃ /C NA@CC	1000/2000	720.0/321.0	200 th /500 th	This work

1.Z. Yang, J. Wang, H.-T. Wu, F.-J. Kong, W.-Y. Yin, H.-J. Cheng, X.-Y. Tang, B. Qian, S. Tao, J. Yi, Y.-S. Ma and R.-X. Yuan, *Applied Surface Science*, 2019, **479**, 693-699.

2.Y. Xiao, J.-Y. Hwang, I. Belharouak and Y.-K. Sun, *Nano Energy*, 2017, **32**, 320-328.

3.J. Zhu and X. Ding, *Materials Letters*, 2019, **253**, 22-25.

4.S.-Y. Liao, T.-T. Cui, S.-Y. Zhang, J.-J. Cai, F. Zheng, Y.-D. Liu and Y.-G. Min, *Electrochimica Acta*, 2019, DOI: 10.1016/j.electacta.2019.134992, 134992.

5.J. Dai, J. Li, Q. Zhang, M. Liao, T. Duan and W. Yao, *Materials Letters*, 2019, **236**, 483-486.

6. W Lin, Y Huang and G He, *CrystEngComm*, 2018, **20**,672 .