

## Supporting Information

### **Bimetallic metal-organic frameworks derived MnS/CoS@C heterostructure with enhanced sodium-ion storage**

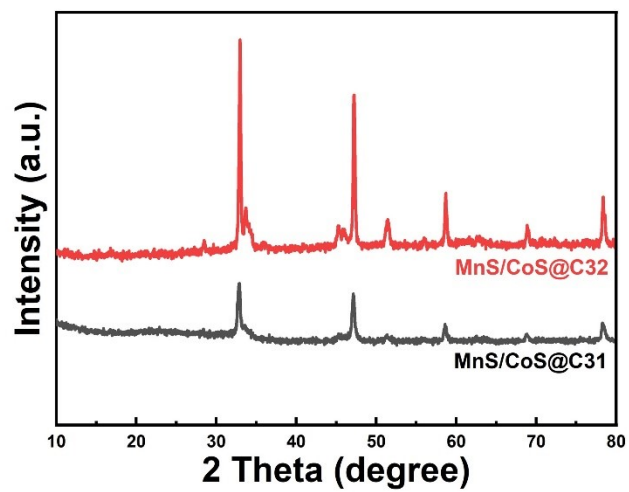
Zongyuan Jiang,<sup>a,†</sup> Shaohui Li,<sup>b,†</sup> Yining Chen,<sup>b</sup> Jingwei Chen,<sup>c</sup> Cong Wei<sup>\*b</sup> and Qun Xu<sup>\*a,b</sup>

<sup>a</sup> *Henan Institute of Advanced Technology, Zhengzhou University, Zhengzhou, 450001, P. R. China*

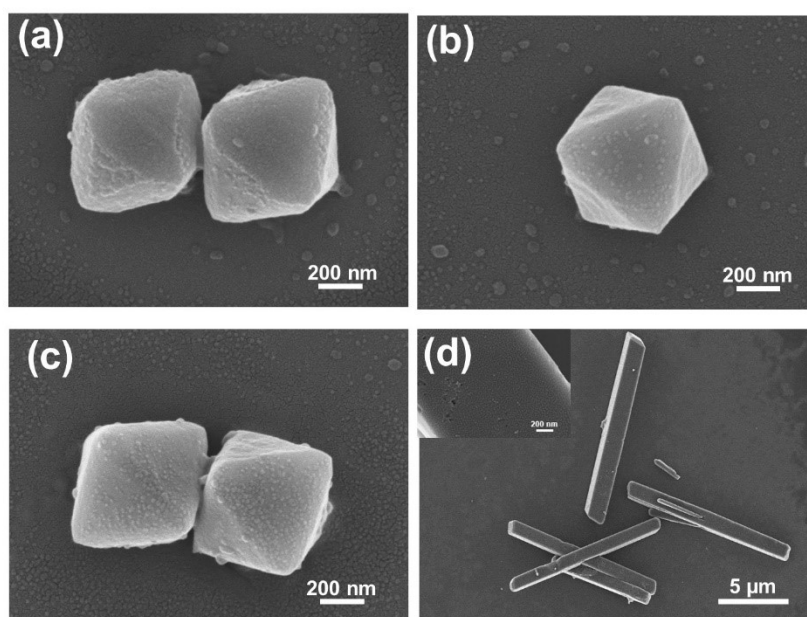
<sup>b</sup> *School of Materials Science and Engineering, Zhengzhou University, Zhengzhou, 450001, P. R. China*

<sup>c</sup> *School of Materials Science and Engineering, Ocean University of China, Qingdao 266100, P. R. China*

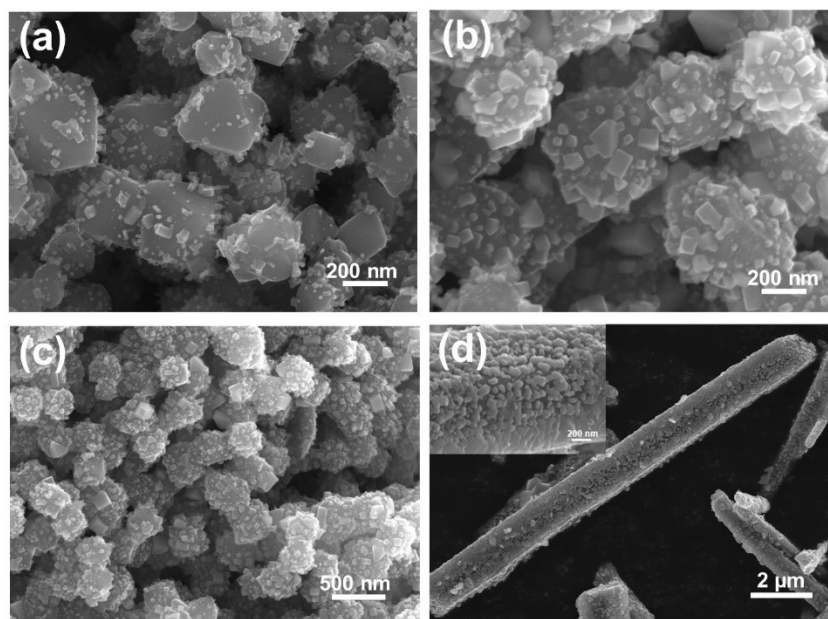
<sup>†</sup> *The two authors contributed equally to this work.*



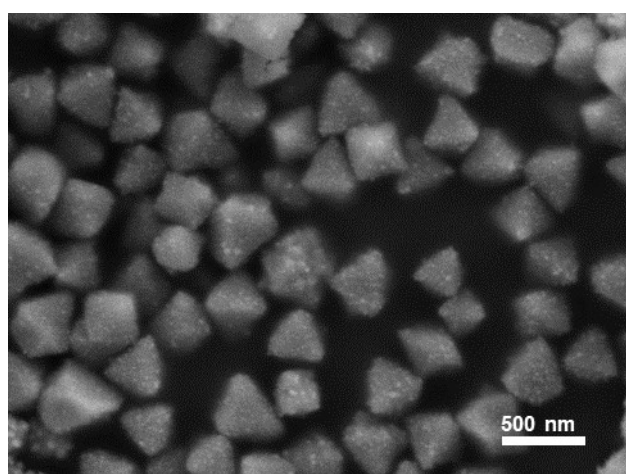
**Fig. S1** XRD patterns of MnS/CoS@C31 and MnS/CoS@C32.



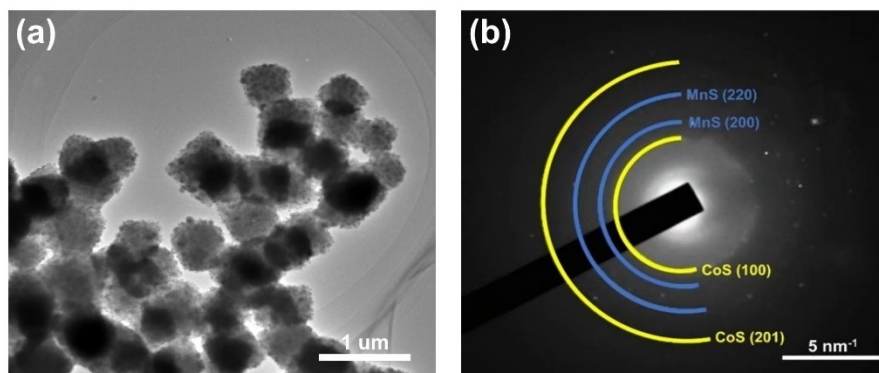
**Fig. S2** (a) SEM image of Mn-MIL-100 MOF. (b) SEM image of Mn/Co-MIL-100-31 MOF. (c) SEM image of Mn/Co-MIL-100-32 MOF. (d) SEM image of Co-BTC MOF (The insert is a high-magnification TEM image).



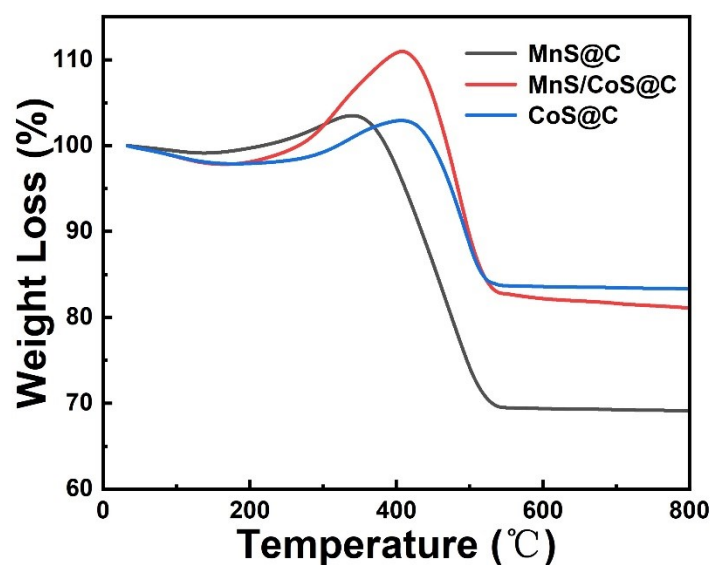
**Fig. S3** (a) SEM image of MnS@C. (b) SEM image of MnS/CoS@C31. (c) SEM image of MnS/CoS@C32. (d) SEM image of CoS@C (The insert is a high-magnification TEM image).



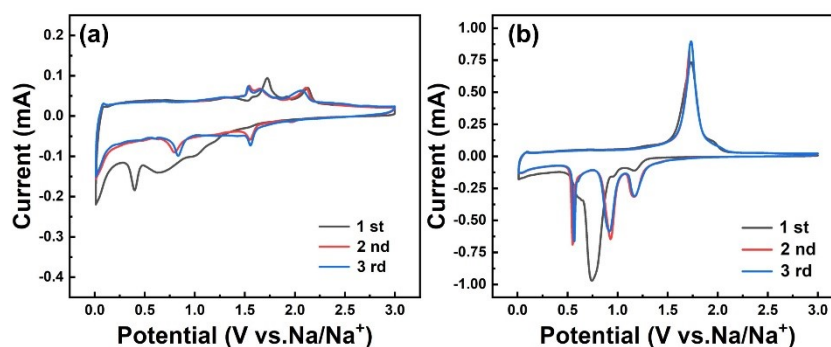
**Fig. S4** SEM image of MnO/CoO@C11.



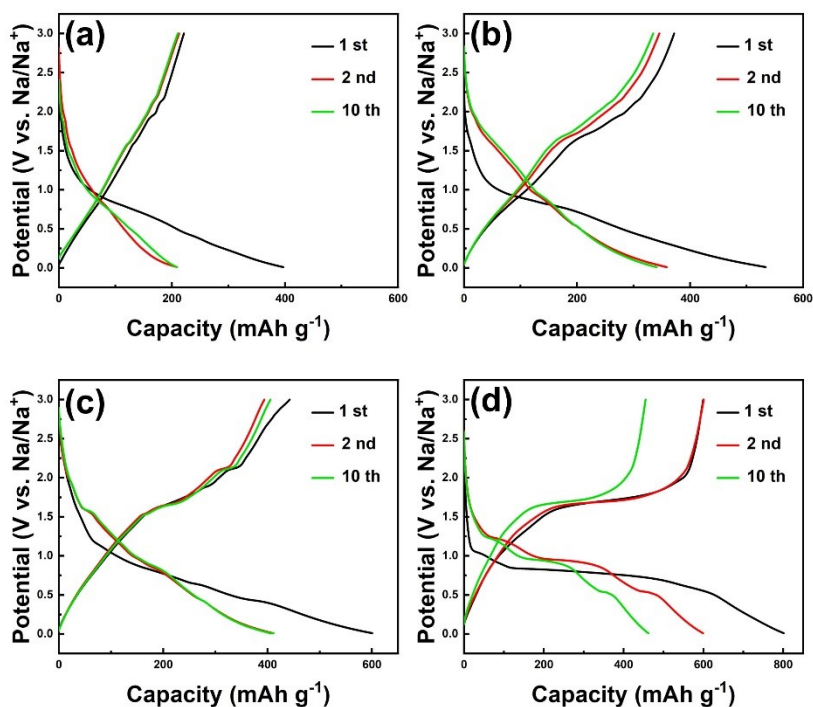
**Fig. S5** (a) TEM images of MnS/CoS@C11. (b) SAED pattern of the MnS/CoS@C11.



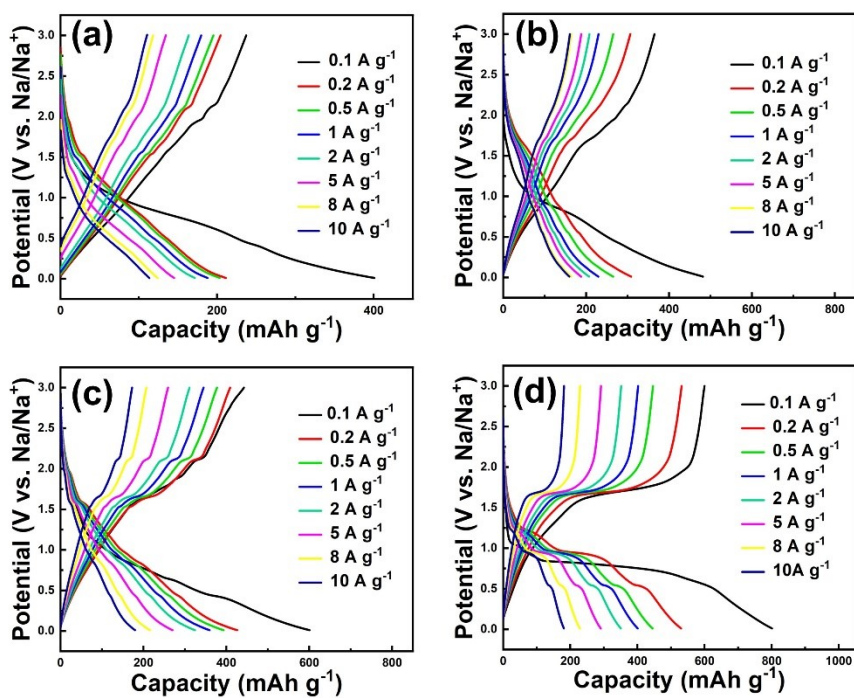
**Fig. S6** TGA curves of MnS@C, MnS/CoS@C and CoS@C samples.



**Fig. S7** (a, b) First three CV curves of MnS @C and CoS@C electrodes at a scan rate of  $0.2 \text{ mV s}^{-1}$ .



**Fig. S8** (a-d) GCD profiles of MnS@C, MnS/CoS@C31, MnS/CoS@C32 and CoS@C electrodes.



**Fig. S9** (a-d) GCD profiles of MnS@C, MnS/CoS@C31, MnS/CoS@C32 and CoS@C electrodes at different current densities.

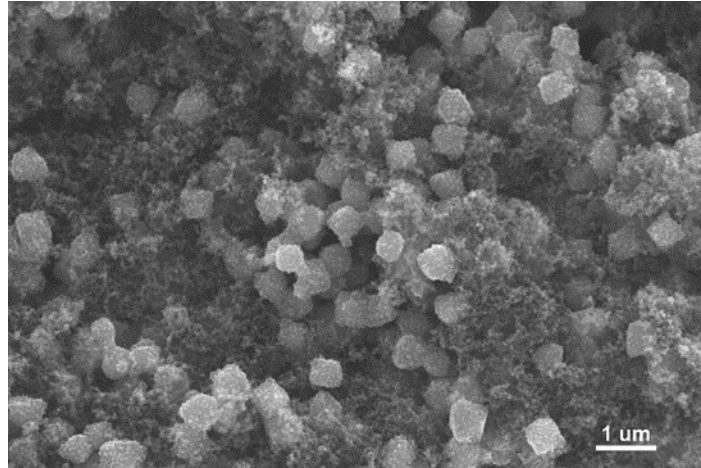


Fig. S10 SEM image of MnS/CoS@C11 electrode after long-term cycling.

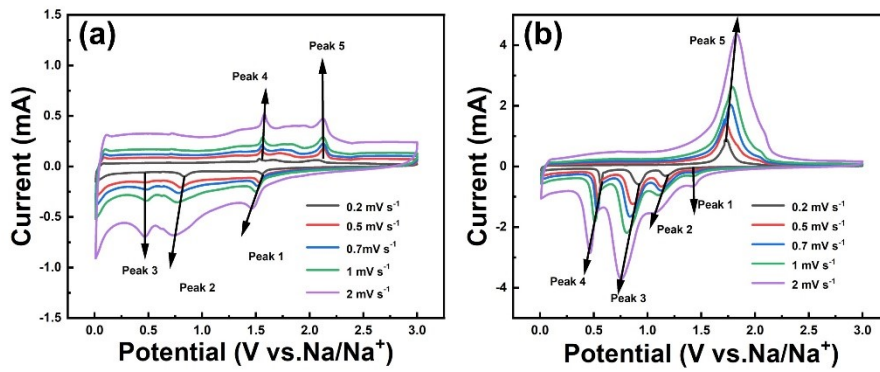


Fig. S11 (a, b) CV curves of MnS@C and CoS@C electrodes at different scan rates.

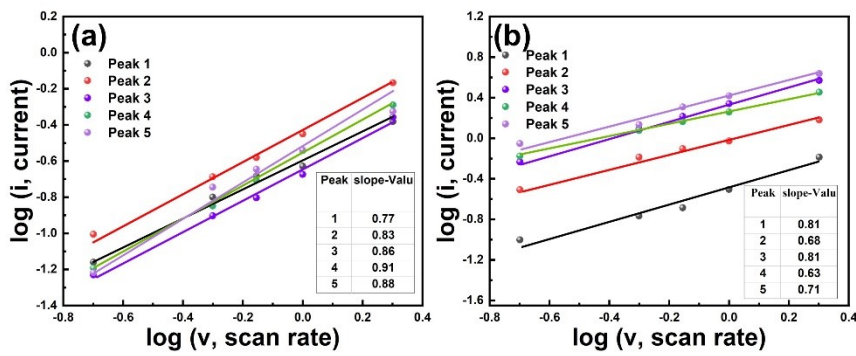
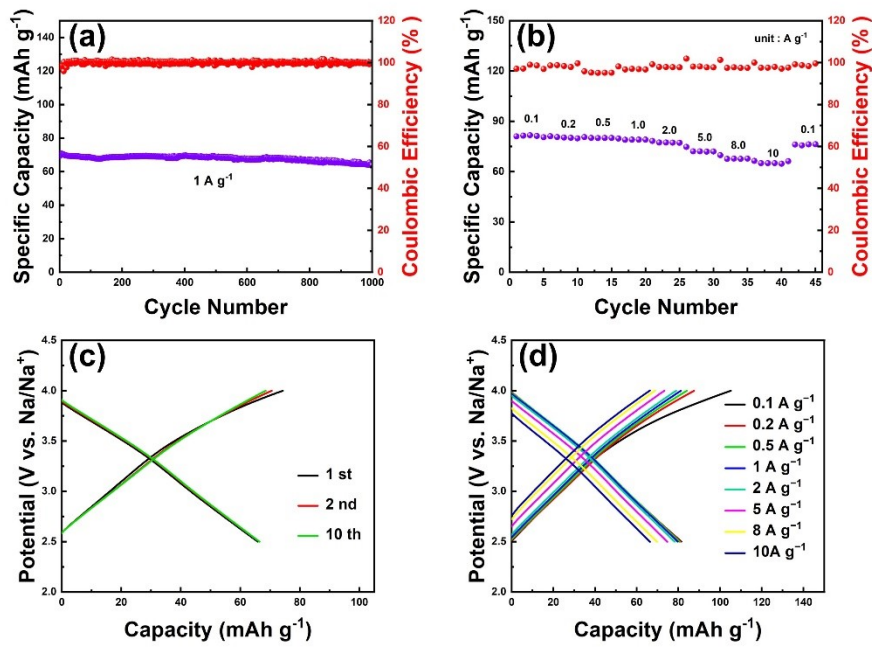
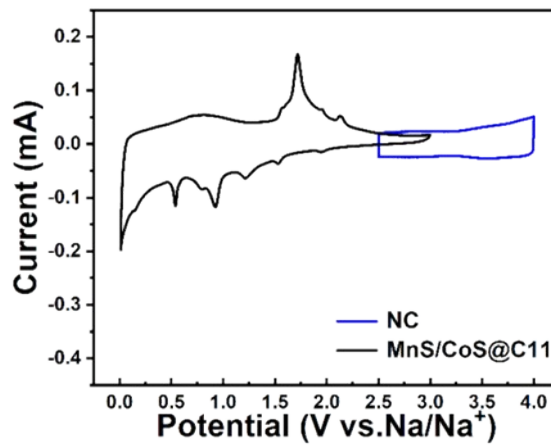


Fig. S12 (a, b) Analysis of b values for cathodic and anodic peaks of MnS@C and CoS@C.

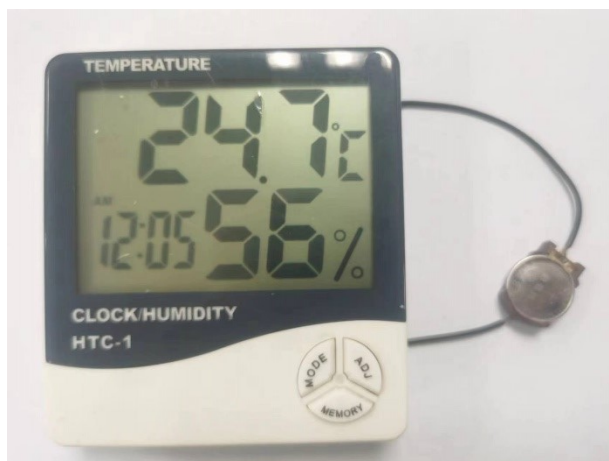




**Fig. S13** (a) Cycling performance of NC at current density of 1 A g<sup>-1</sup>. (b) Rate performance of NC. (c) GCD profiles of NC. (d) GCD profiles of NC at different current densities.



**Fig. S14** CV curves of MnS/CoS@C11 anode and NC cathode in sodium-ion half-cell.



**Fig. S15** Demonstration to power a humidity/temperature sensor by one charged SIC.