**Supporting Information**

# Binary zinc-cobalt metal-organic frameworks derived mesoporous $ZnCo_2O_4$@NC polyhedron as high-performance lithium-ion battery anode

Rui Sun[a, b], Zhaoxia Qin[a, b], Zhiyong Li[a, b], Haosen Fan[b]* and Shengjun Lu[a]*

[a]*College of Materials Science and Metallurgy Engineering, Guizhou University, Guiyang 550025, PR China*

[b]*School of Chemistry and Chemical Engineering, Guangzhou University, Guangzhou 510006, China*

E-mail: hsfan@gzhu.edu.cn; sjlu@gzu.edu.cn

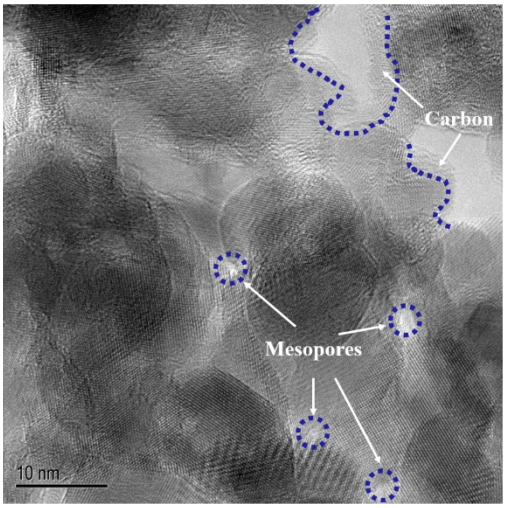


Fig. S1 High-resolution TEM image of the mesoporous $ZnCo_2O_4$@NC polyhedrons.

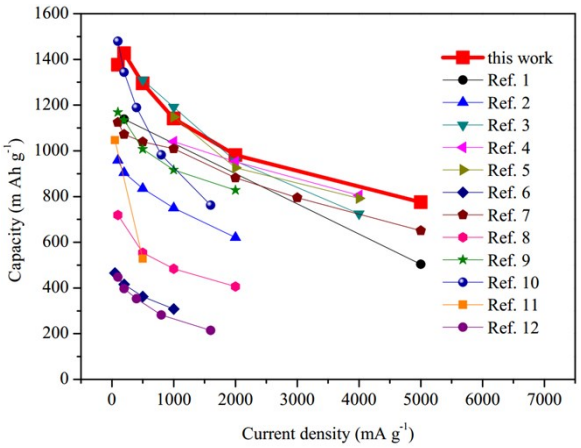


Fig. S2 Comparison of the rate property of $ZnCo_2O_4$@NC polyhedrons with other reported $ZnCo_2O_4$-based electrode materials.

Table. S1 Summary of the preparation strategies of $ZnCo_2O_4$-based nanostructures and lithium ion storage properties.

| Materials | Methods | Initial discharge/charge (mAh $g^{-1}$/ mAh $g^{-1}$/ mA $g^{-1}$) | Rate performance (mAh $g^{-1}$/mA $g^{-1}$) | Cycle capacity (mAh $g^{-1}$/th/mA $g^{-1}$) | Ref. |
|---|---|---|---|---|---|
| **$ZnCo_2O_4$@NC polyhedron** | **Co-precipitation** | **1495/1140/100** | **775/5000** | **1082/300$^{th}$/1000** | **This work** |
| $ZnCo_2O_4$ yolk-shell sphere | Carbon template | 1586/1171/200 | 504/5000 | 910/300$^{th}$/1000 | [1] |
| $ZnCo_2O_4$ microcube | Hydrothermal synthesis | 1087/937/100 | 621/2000 | 588/1000$^{th}$/1000 | [2] |
| $ZnCo_2O_4$ cuboids | Micro-emulsion | 1376/1156/500 | 724.4/4000 | 1069/300$^{th}$/500 | [3] |
| $ZnCo_2O_4$@C micro-hydrangeas | Solvothermal treatment | 1418.1/1129.0/1000 | 455.4/1000 | 964.6/200$^{th}$/1000 | [4] |
| $ZnCo_2O_4$@C microspheres | Hydrothermal synthesis | 1521.9/1274.2/1000 | 675.4/6000 | 998.5/200$^{th}$/1000 | [5] |
| $ZnCo_2O_4$EC Nanofibers | Co-precipitation | 733/482/50 | 308/1000 | 463/100$^{th}$/50 | [6] |
| $ZnCo_2O_4$@C nanotubes | Co-precipitation | 2247/1398/100 | 651/5000 | 906/600$^{th}$/1000 | [7] |
| C/$ZnCo_2O_4$-C nanofibers | Hydrothermal synthesis | 1947.1/763.1/100 | 406/2000 | 430.4/1000$^{th}$/2000 | [8] |
| $ZnCo_2O_4$-NC particles | Sol-gel method | 1415.2/1142/100 | 827.7/2000 | 903.1/100$^{th}$/1000 | [9] |
| $ZnCo_2O_4$-NiO@Ni | Template method | 2166.7/1595.8/100 | 762.4/1600 | 730.5/200$^{th}$/800 | [10] |
| $ZnCo_2O_4$-Rgo nanosheets | Solvothermal method | 801.5/778.5/100 | 527/500 | 1107/100$^{th}$/100 | [11] |
| $ZnCo_2O_4$-rGO yolk-shell spheres | Co-precipitation | 1587.1/1104.9/200 | 523.7/2000 | 997.2/500$^{th}$/1000 | [12] |

**Reference:**


1. J. Deng, X. Yu, X. Qin, B. Li and F. Kang, *J. Alloy Compd.*, 2019, **780**, 65-71.

2. H. Xu, Y. Zhang, X. Song, X. Kong, T. Ma and H. Wang, *J. Alloy Compd.*, 2020, **821**. 153289.

3. S. Cheng, Q. Ru, P. Liu, H. Yan, Z. Shi, X. Hou, S. Su, L. Zhao and F. Chi-Chung Ling, *J. Alloy Compd.*, 2019, **809**. 151703.

4. C. Ding, W. Xu, M. Wang, X. Zeng and W. Wang, *Inter. J. Energy Res.*, 2019, **44**, 977-987.

5. C. Ding, W. Xu, X. Zeng, M. Wang, W. Wang and Z. Qing, *Ionics*, 2019, **26**, 703-710.

6. H. Li, S. Wang, M. Feng, J. Yang and B. Zhang, *Chin. Chem. Lett.*, 2019, 30, 529-532.

7. H. Li, L. Lv, W. Wang, X. Huang and D. Chen, *J. Mater. Chem. A*, 2019, 7, 22642-22649.

8. Y. Wang, X. Zhu, D. Liu, H. Tang, G. Luo, K. Tu, Z. Xie, J. Lei, J. Li, X. Li and D. Qu, *J. Appl. Electrochem.*, 2019, 49, 1103-1112.

9. X. Wu, M. Zeng, L. Wang and J. Li, *J. Alloy Compd.*, 2019, 780, 897-906.

10. L. Zhang, S. Zhu, X. Li, H. Fang, L. Wang, Y. Song and X. Jia, *Ionics*, 2019, 26, 2157-2164.

11. Q. Feng, Y. Du, S. Liang and H. Li, *Nanotechnology*, 2020, 31. 045402.

12. Z. Zhang, Y. Huang, X. Liu, X. Wang and P. Liu, *Electrochim. Acta*, 2020, 342. 136104.