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# Supporting Information

for

# Nanoarchitectonics of the cathode to improve the reversibility of Li–$O_2$ batteries

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## Additional TEM, EDS, XRD, XPS, BET, SEM, and cathodic overpotential measurements

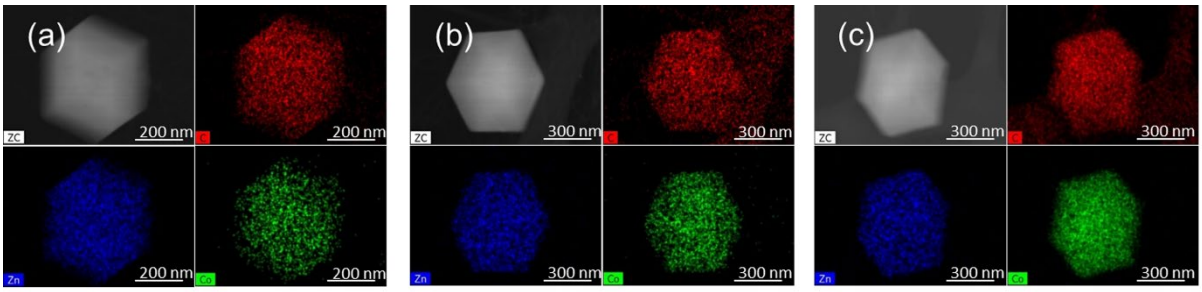


**Figure S1:** EDS elemental mapping results for (a) $Zn_4Co_1$/CNT, (b) $Zn_1Co_1$/CNT, and (c) $Zn_1Co_4$/CNT.

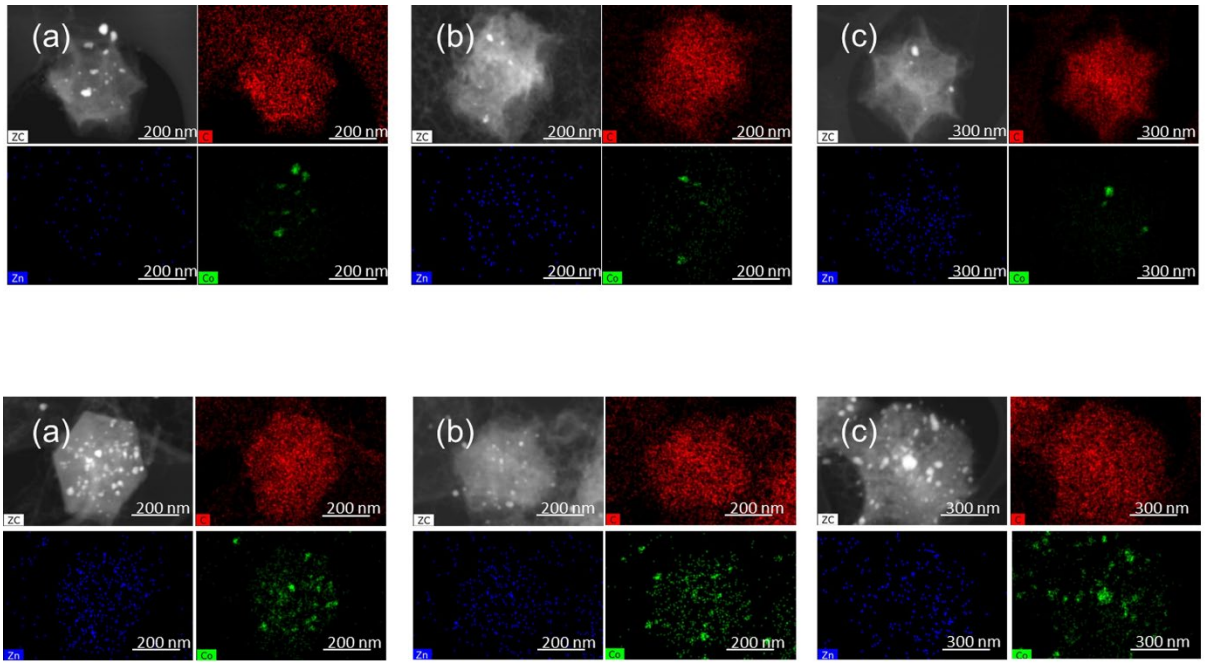


**Figure S2:** EDS elemental mapping results for (a) $Zn_4Co_1$–C/CNT, (b) $Zn_1Co_1$–C/CNT, and (c) $Zn_1Co_4$–C/CNT.

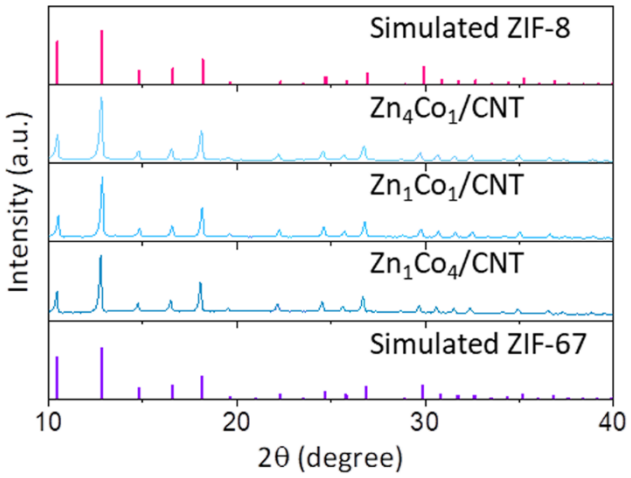


**Figure S3:** XRD patterns of as-synthesized $Zn_xCo_y$/CNT composites.

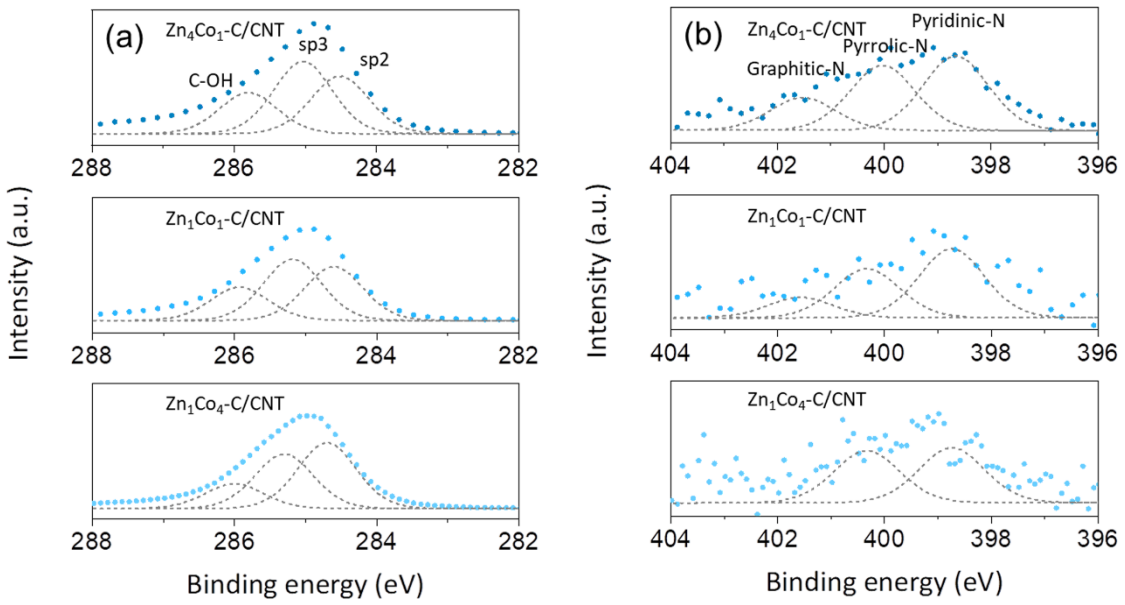


**Figure S4:** XPS spectra of $Zn_xCo_y$–C/CNT: (a) C 1s, and (b) N 1s.

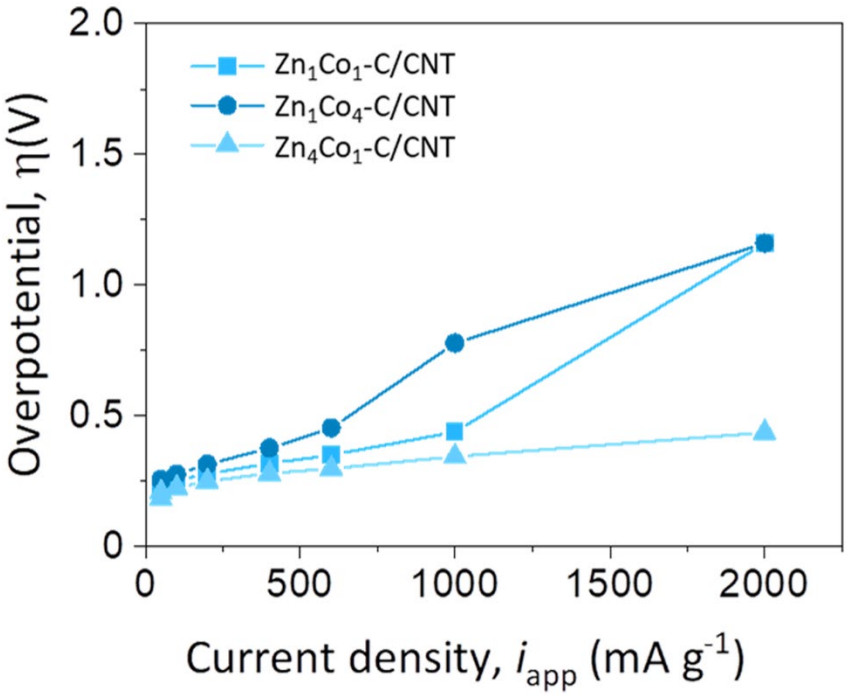


**Figure S5:** Cathodic overpotential (η) as a function of current density for LOBs with $Zn_xCo_y$–C/CNT electrodes. The cells were discharged in pure $O_2$ with a limited capacity of 500 mAh·g$^{-1}$ at various current densities in the range of 50–2,000 mA·g$^{-1}$.

**Table S1:** Specific surface area and micro/meso/macropore volumes.

| Material | BET surface area ($m^2 \cdot g^{-1}$) | Micropore volume ($cm^3 \cdot g^{-1}$) | Mesopore volume ($cm^3 \cdot g^{-1}$) | Mesopore volume ($cm^3 \cdot g^{-1}$) |
|---|---|---|---|---|
| $Zn_1Co_4$–C/CNT | 305 | 0.04 | 1.23 | 0.05 |
| $Zn_1Co_1$–C/CNT | 357 | 0.03 | 0.95 | 0.05 |
| $Zn_4Co_1$–C/CNT | 489 | 0.07 | 0.88 | 0.04 |

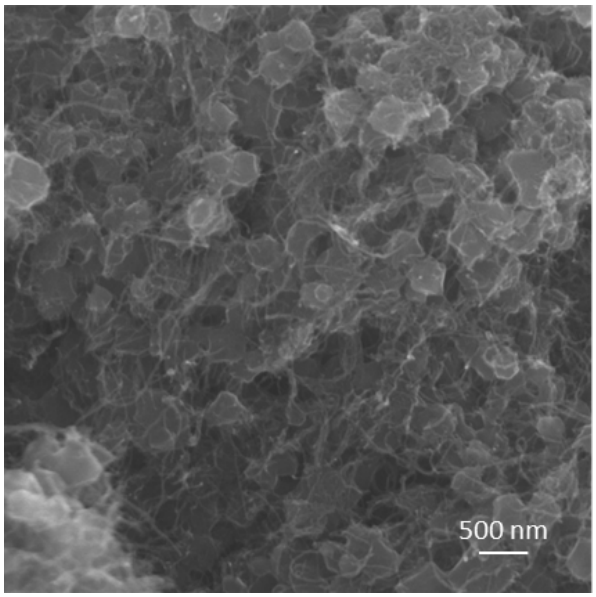


**Figure S6:** SEM image of the $Zn_4Co_1$–C/CNT electrode (charged) after 100 cycles.

**Table S2:** Electrochemical performance of cathodes based on CNTs, MOFs, or mesoporous carbon for Li-$O_2$ batteries.

| Material | Current density | Depth of discharge | Number of cycles | Reference |
|---|---|---|---|---|
| Multiwalled CNT paper | 250 $mA \cdot g^{-1}$ | 1000 $mAh \cdot g^{-1}$ | 50 | S1 |
| Multiwalled CNT foam | 372 $mA \cdot g^{-1}$ | 510 $mAh \cdot g^{-1}$ | 100 | S2 |
| Ordered mesoporous carbon | 200 $mA \cdot g^{-1}$ | 2000 $mAh \cdot g^{-1}$ | 25 | S3 |
| CNT | 0.05 $mA \cdot cm^{-2}$ | 0.5 $mAh \cdot cm^{-2}$ | 73 | S4 |
| Mn–MOF-74 | 250 $mA \cdot g^{-1}$ | 1000 $mAh \cdot g^{-1}$ | 30 | S5 |
| MOF–C/CNT | 200 $mA \cdot g^{-1}$ | 500 $mAh \cdot g^{-1}$ | 137 | This work |

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S3. Park, J. B.; Lee, J.; Yoon, C. S.; Sun, Y. K. ACS Appl. Mater. Interfaces **2013**, 5, 13426-13431.

S4. Nomura, A.; Ito, K.; Kubo, Y. Sci. Rep. **2017**, 7, 45596.

S5. Wu, D.; Guo, Z.; Yin, X.; Pang, Q.; Tu, B.; Zhang, L.; Wang, Y. G.; Li, Q. Adv. Mater. **2014**, 26, 3258-3262.