Co/N-doped hierarchical porous carbon as efficient oxygen electrocatalysis for rechargeable Zn-air battery

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**Figure S1.** (a-d) SEM images of HPC, NHPC, Co/NHPC-700 and Co/NHPC-900, (e-f) TEM images of Co/NHPC-700 and Co/NHPC-900.
Figure S2. Survey spectrum of Co/NHPC-800

Table S1. The $t$-Plot report of HPC, NHPC, Co/NHPC-700, Co/NHPC-800 and Co/NHPC-900.

| $t$-Plot report | $S_{\text{micro}}$ | $S_{\text{external}}$ | $V_{\text{micro}}$ | $V_{\text{total}}$ |
|-----------------|---------------------|------------------------|--------------------|---------------------|
| HPC             | 259                 | 628                    | 0.13               | 0.59                |
| NHPC            | 349                 | 622                    | 0.17               | 0.43                |
| Co/NHPC-700     | 341                 | 646                    | 0.16               | 0.50                |
| Co/NHPC-800     | 367                 | 701                    | 0.18               | 0.57                |
| Co/NHPC-900     | 355                 | 706                    | 0.17               | 0.64                |
Figure S3. (a-f) CV curves of WC, HPC, NHPC, Co/NHPC-700, Co/NHPC-800 and Co/NHPC-900, respectively.

Figure S4. LSV curves of Co/NHPC-800 with different rotate speed in O$_2$-saturated 0.1 M KOH.
Table S3. The comparison of ORR, OER and dual catalytic performances in this work to some results from literatures.

| Sample                  | $E_{\text{ORR}}$ | $E_{\text{ORR}/2}$ | Transferre $d$ | $E_{\text{OER}}$ [V] | $\Delta E$ (E$_{1/2}$) (V) | RZABs | Ref. |
|-------------------------|-----------------|-------------------|----------------|-------------------|----------------------------|-------|------|
| Co, N-doped CNTs        | 0.89            | 0.79              | ~4             | 1.61              | 0.82                       | 12    | S1   |
| Co@Co$_3$O$_4$/NC-1     | 0.90            | 0.80              | 3.78           | 1.65              | 0.85                       | NA    | S2   |
| NiCo$_2$O$_4$@N-graphene| 0.87            | 0.75              | 3.9             | 1.63              | 0.88                       | 13    | S3   |
| NMC/Co@CNTs             | 0.90            | 0.79              | 3.76-3.98      | 1.73              | 0.94                       | 11    | S4   |
| Fe/N-CNT                | 0.96            | 0.81              | 3.85-3.90      | 1.75              | 0.94                       | NA    | S5   |
| Co/N-C-800              | 0.88            | 0.74              | 3.95           | 1.60              | 0.86                       | 76    | S6   |
| Co$_3$O$_4$/N-rGO       | 0.92            | 0.79              | 3.90           | 1.72              | 0.93                       | 25    | S7   |
| Co$_3$O$_4$/Co$_2$MnO$_4$nanocomposite | 0.90 | 0.68 | 3.51–3.82 | 1.77 | 1.09 | - | S8 |
| NiCoMnO$_4$/N-rGO       | 0.92            | 0.72              | 3.92           | 1.77              | 1.05                       | -     | S9   |
| Co/NHPC-800             | 0.92            | 0.82              | 3.8-4.0        | 1.71              | 0.89                       | 364   | This work |

Figure S5. (a-f) Photographs of the assembly process for the fabrication of a rechargeable...
Zn-air battery.

Figure S6. (a-d) Photographs of the rechargeable Zn-air battery recorded from different directions.

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