

**In-situ growth of CoP nanoparticles anchored on (N, P) co-doped porous carbon
engineered by MOFs as advanced bifunctional oxygen catalyst for rechargeable
Zn-air battery**

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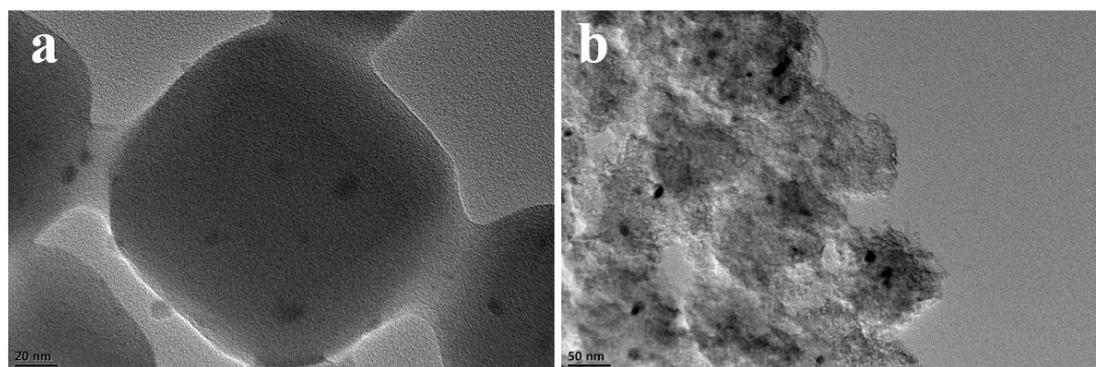


Fig. S1 TEM morphology of the ZnCo-MOF (a) and the Co/N-HPC (b).

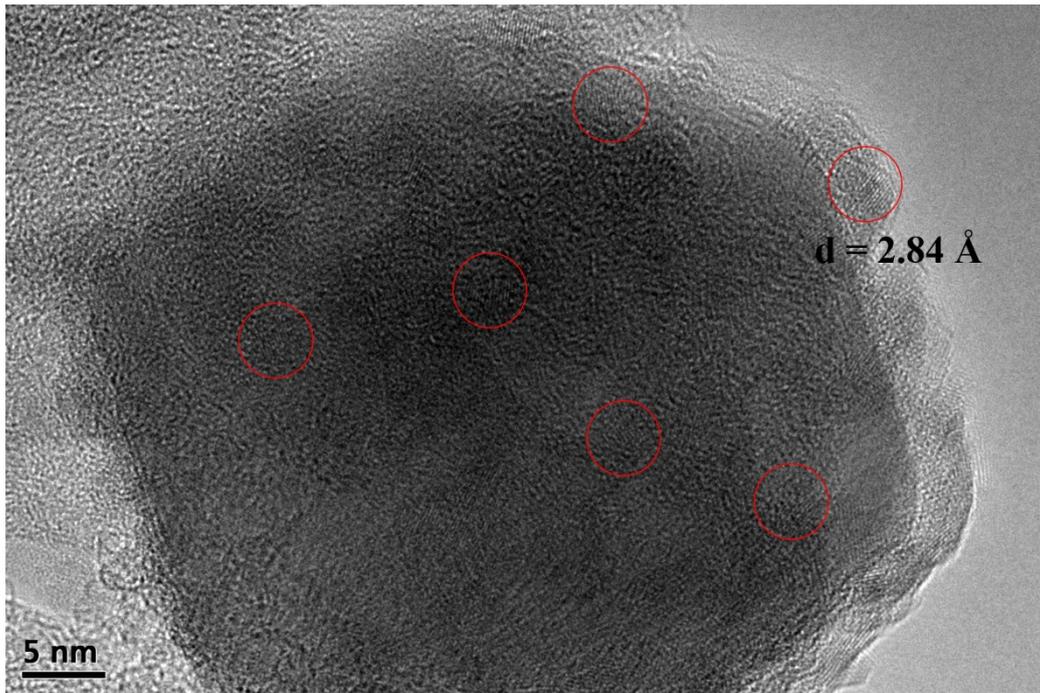


Fig. S2 The HRTEM morphology of the CoP/NP-HPC and the lattice spacing of CoP particles.

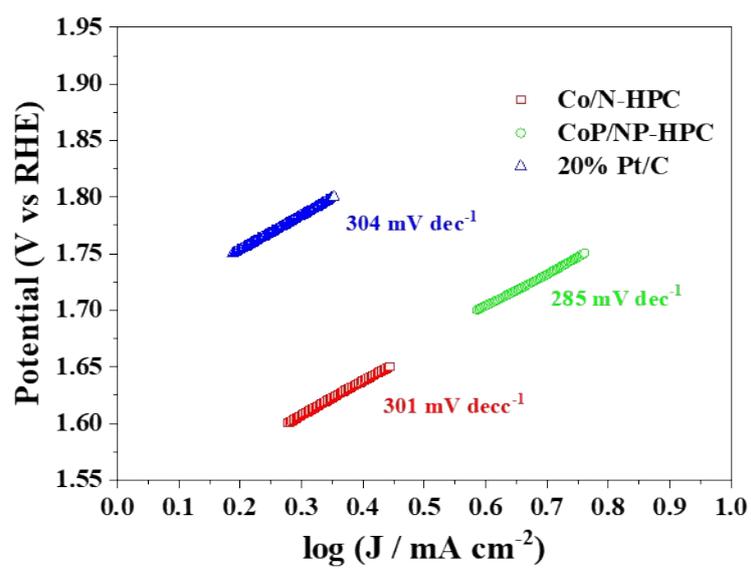


Fig. S3 Tafel plots of the catalysts for ORR

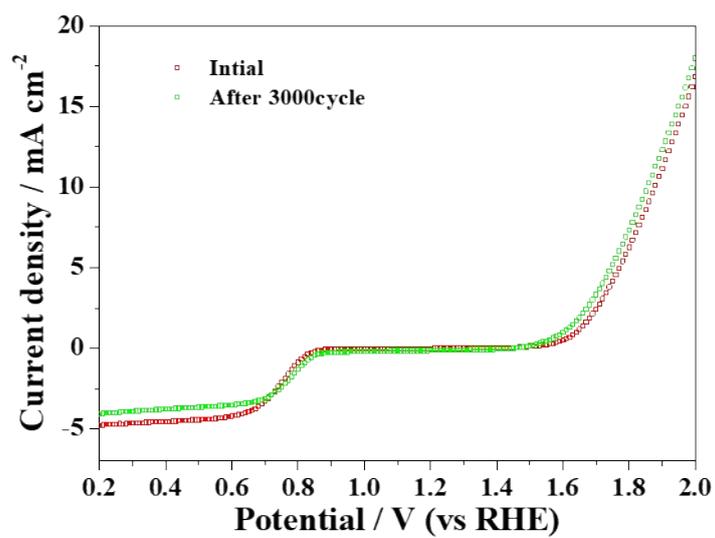


Fig. S4 The overall oxygen electrode activity of CoP/NP-HPC for ORR and OER before and after 3000 cycles.

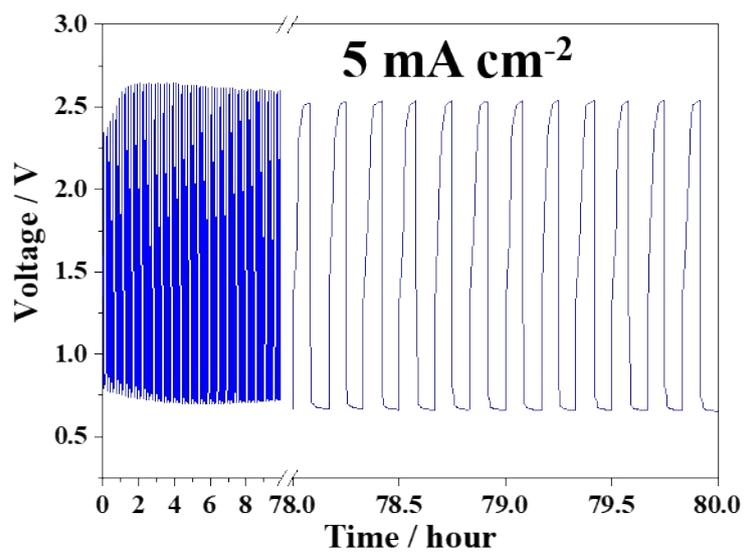


Fig. S5 The discharge/charge cycling curves of rechargeable Zn-air batteries at 5 mA cm^{-2} .

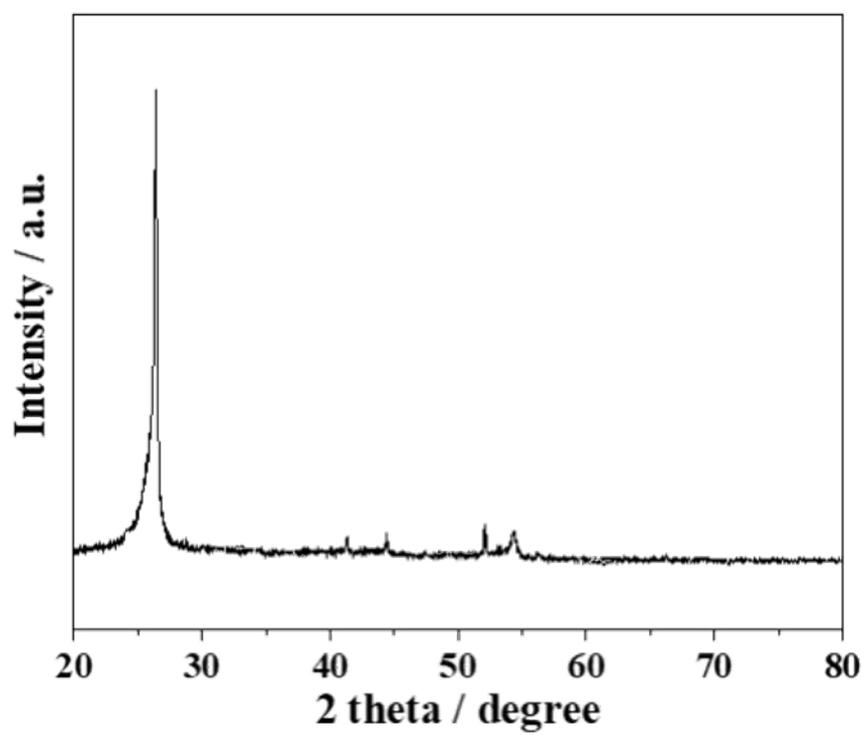


Fig. S6 The XRD spectra of the CoP/NP-HPC after 7 h charge-discharge process.

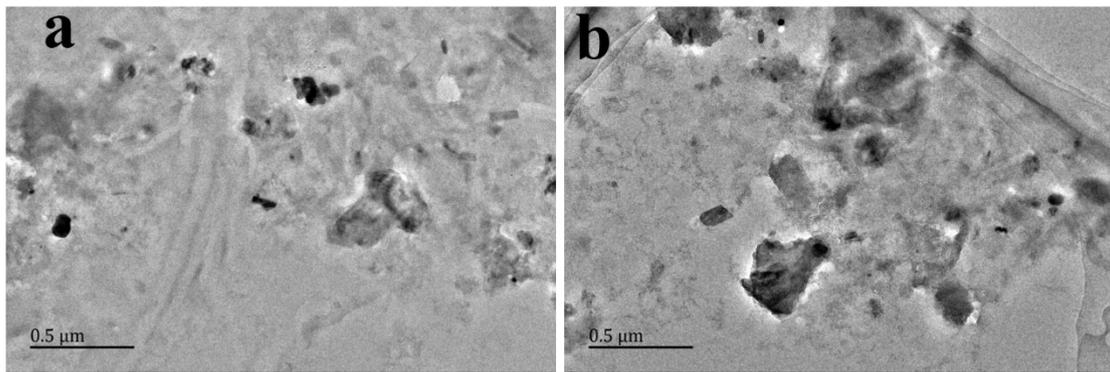


Fig. S7 The TEM morphology of the CoP/NP-HPC after 7 h charge-discharge process.

Table S1 Surface area and pore size of the obtained Co/N-HPC and CoP/NP-HPC.

Sample	Surface area ($\text{m}^2 \text{g}^{-1}$)	Pore size (nm)	Pore volume ($\text{cm}^3 \text{g}^{-1}$)
Co/N-NPC	369	8.1	0.51
CoP/NP-NPC	323	10.9	0.53

Table S2 Catalytic activity of Co based phosphides for ORR in 0.1M KOH solution.

Sample	E_{onset} (V)	$E_{1/2}$ (V)	Ref.
CoP/NP-HPC	0.95	0.83	In this work
Co ₂ P-40	0.80	-	1
NC-CoP	0.82	-	2
In-CoO/CoP FNS	0.94	0.81	3
Bi-CoP/NP-DG	0.93	0.81	4
NC@CoP _x /PyCNTs	0.92	0.80	5
Fe _{0.33} -CoP/NF	0.90	0.80	6
CoP@SNC	0.87	0.79	7
CoP-DC	0.91	0.81	8
Co ₂ P@NPC	-	0.82	9
CoP NCs	0.92	-	10
Co ₂ P	0.87	0.78	11
Co/CoP-HNC	0.94	0.83	12
HCNT-Co ₂ P	0.86	0.79	13
Co ₂ P@CoNPG	0.90	0.81	14
FexP/NPCS	0.92	0.83	15
Co-NC@CoP-NC	0.89	0.79	16
CoNP@NC/NG	0.93	-	17
CoP	0.80	0.70	18
Co _x P-CNTs-1000	0.86	0.78	19

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