

Supplementary Materials

Hierarchical ZnCo CNFs@CNTs as High-Performance Bifunctional Air Electrodes for Rechargeable Zinc-Air Batteries

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Figures

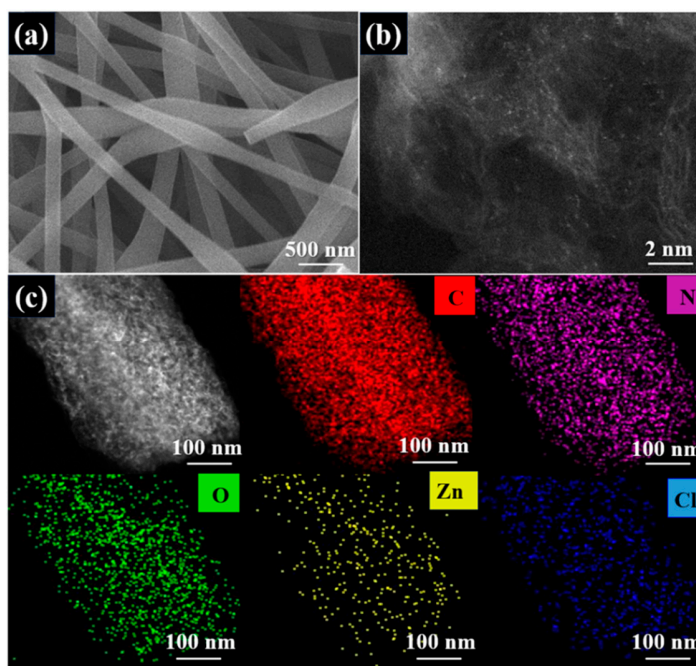


Figure S1. SEM image of Zn CNFs and AC HAADF-STEM images with corresponding elemental mapping results: (a) Zn CNFs; (b, c) AC HAADF-STEM images and elemental mappings.

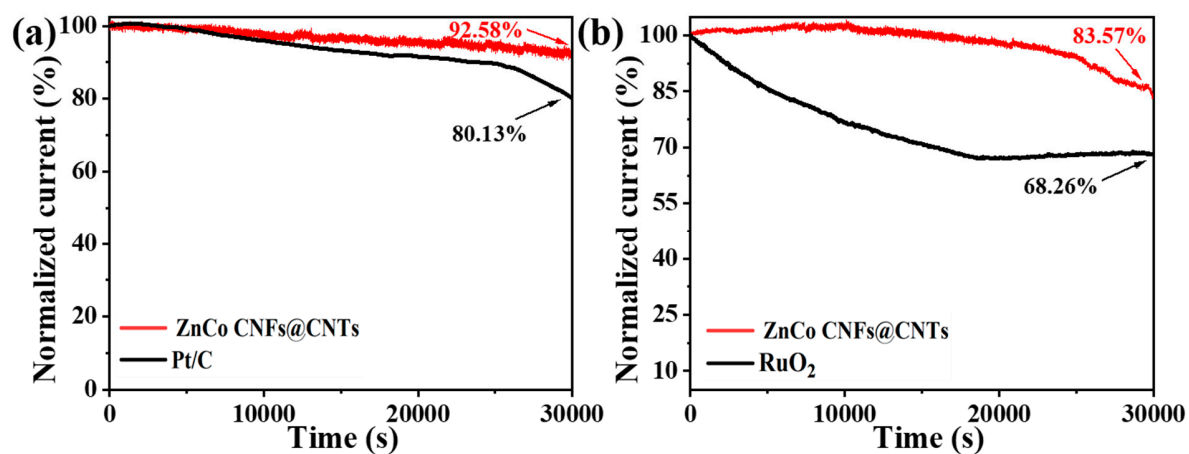


Figure S2. (a) Chronoamperometric ORR curves at 0.76 V for ZnCo CNFs@CNTs and Pt/C; and (b) OER stability curves at 1.65 V for ZnCo CNFs@CNTs and RuO₂.

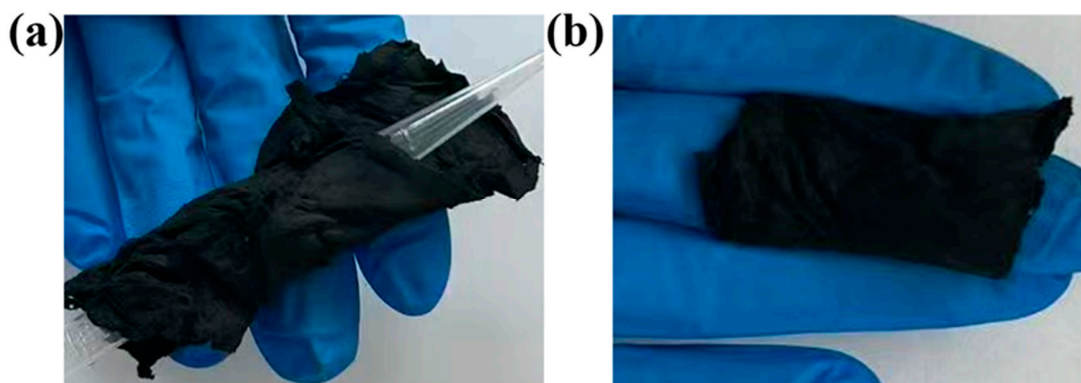


Figure S3. (a-b) Flexibility test of ZnCo CNFs@CNTs.

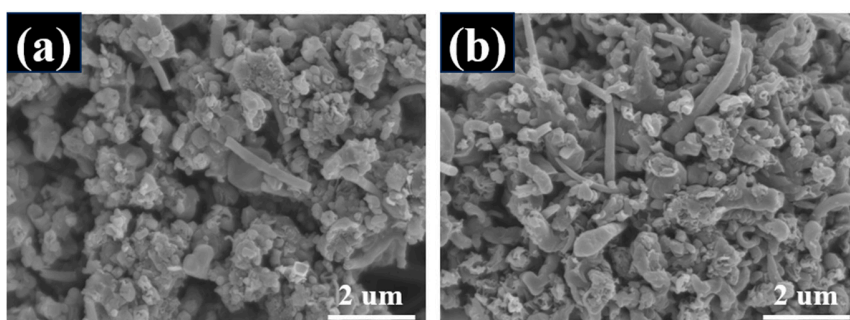


Figure S4. SEM images of the air cathode (a) before and (b) after completion of the battery cycling test.

Tables

Table S1. Comparison of ORR and OER activities of ZnCo CNFs@CNTs with other recently reported noble metal-free catalysts [32–36].

Catalysts	$E_{1/2}$ (V vs. RHE)	$E_{j=10}$ (V vs. RHE)	ΔE (V)	Loading (mg cm ⁻²)	Electrolyte	References
FeCo-N-C	0.81	1.61	0.8	/	/	<i>Rare Met.</i> 2023 , 42, 1526-1534.
Mn/Co-450	0.78	1.61	0.83	/	/	<i>Appl. Catal. B Environ.</i> 2022 , 319, 121909.
ZCSe _x @CNFs	0.923	/	/	0.06	0.1 M KOH	<i>Diamond Relat. Mater.</i> 2023 , 136, 109997.
ZN ₃ -CNFs-900	0.834	1.659	0.825	0.06	0.1 M KOH	<i>J. Colloid Interface Sci.</i> 2025 , 690, 137325.
NiCo@C@CoMn CNFs	0.82	1.63	0.81	0.06	0.1 M KOH	<i>J. Energy Storage.</i> 2025 , 107, 114907.
ZnCo CNFs@CNTs	0.86	1.64	0.78	0.06	0.1 M KOH	This work

Table S2. Fitted R_s and R_{ct} values of ZnCo CNFs@CNTs, Co CNFs@CNTs, Zn CNFs and CNFs derived from EIS measurements.

Catalysts	R_s (Ω)	R_{ct} (Ω)
ZnCo CNFs@CNTs	14.76	97.13
Co CNFs@CNTs	9.144	129.2
Zn CNFs	13.44	133.4
CNFs	9.845	142.1