



Supplementary Material

CoFeS₂@CoS₂ Nanocubes Entangled with CNT for Efficient Bifunctional Performance for Oxygen Evolution and Oxygen Reduction Reactions

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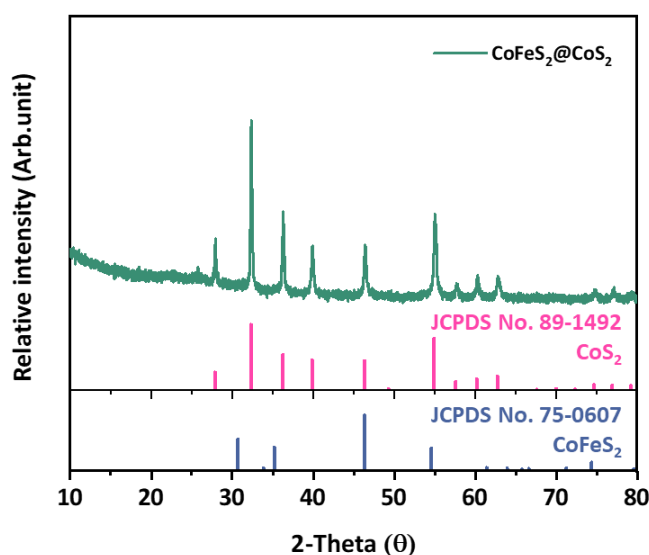


Figure S1. XRD data of pure CoFeS₂@CoS₂.

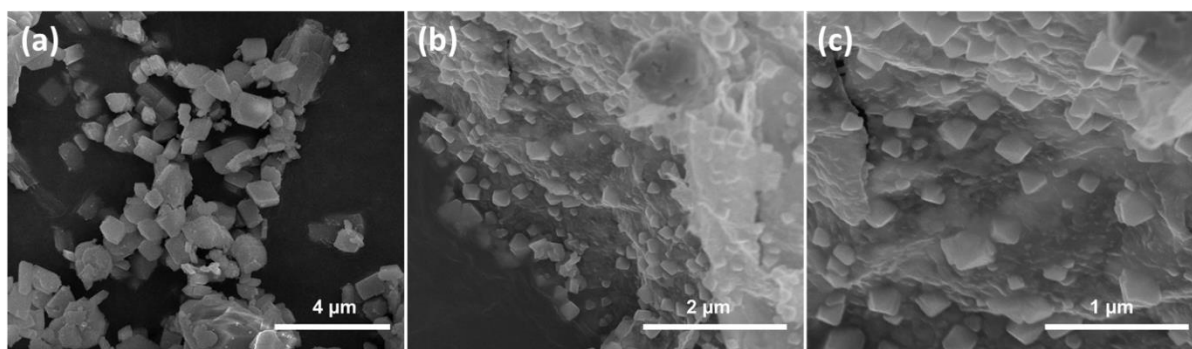


Figure S2. (a–c) Microstructure of pure $\text{CoFeS}_2@\text{CoS}_2$.

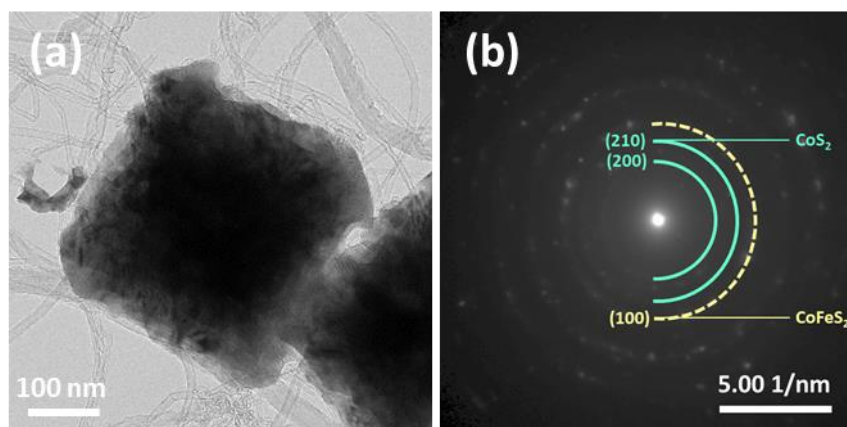


Figure S3. (a) TEM image of $\text{CoFeS}_2@\text{CoS}_2/\text{CNTs}$ with (b) SAED pattern.

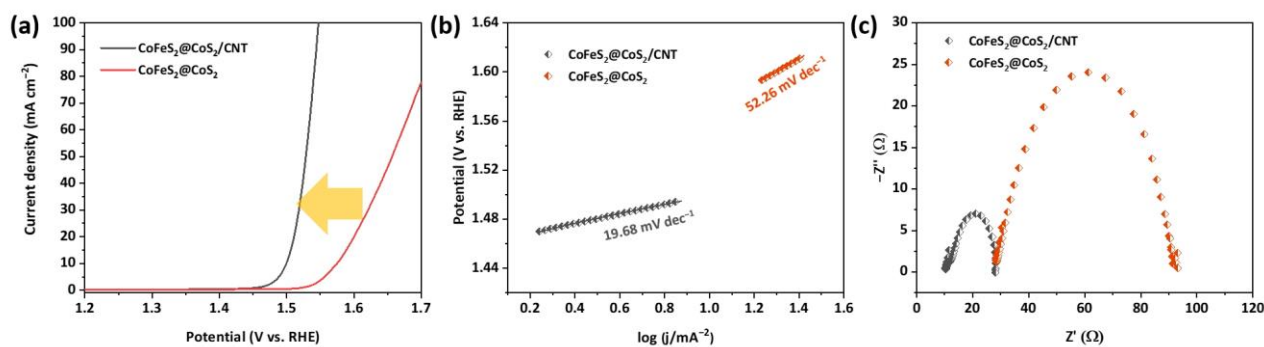


Figure S4. OER properties of the $\text{CoFeS}_2@\text{CoS}_2$ with/without CNTs (a) LSV curve, (b) Tafel plot, (c) Nyquist plot.

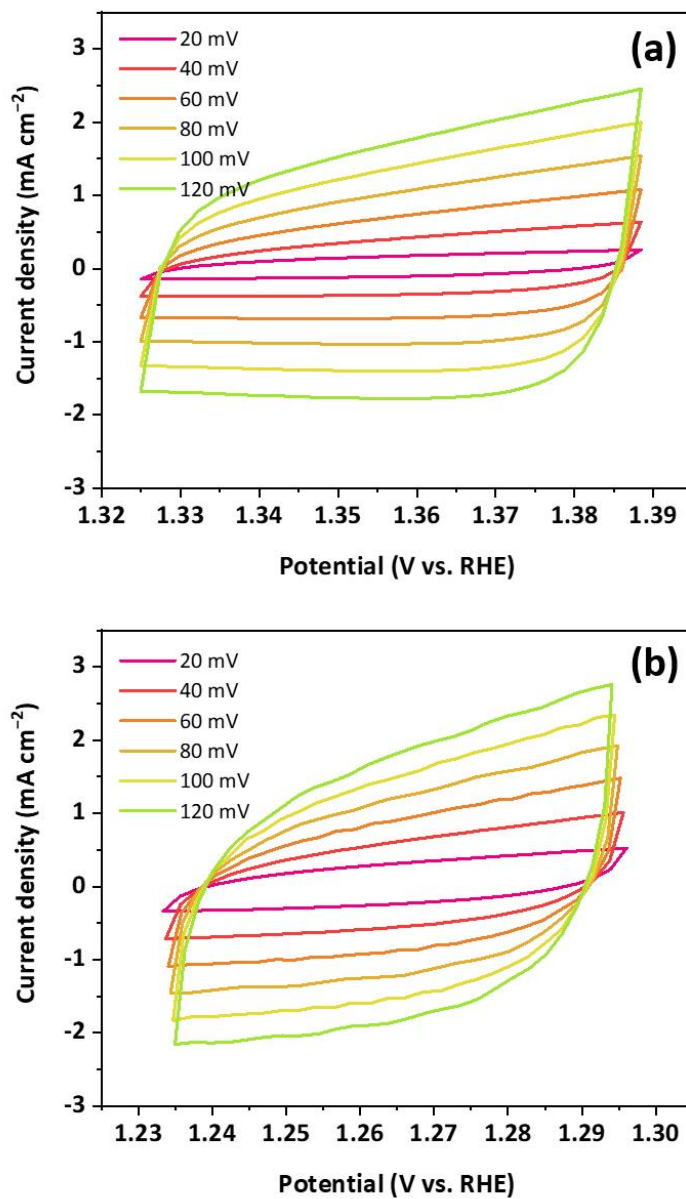


Figure S5. CV measurements in a capacitive current region at scan rates 20, 40, 60, 80, 100, and 120 s⁻¹ of (a) CoS₂/CNTs and (b) CoFeS₂@CoS₂/CNTs.

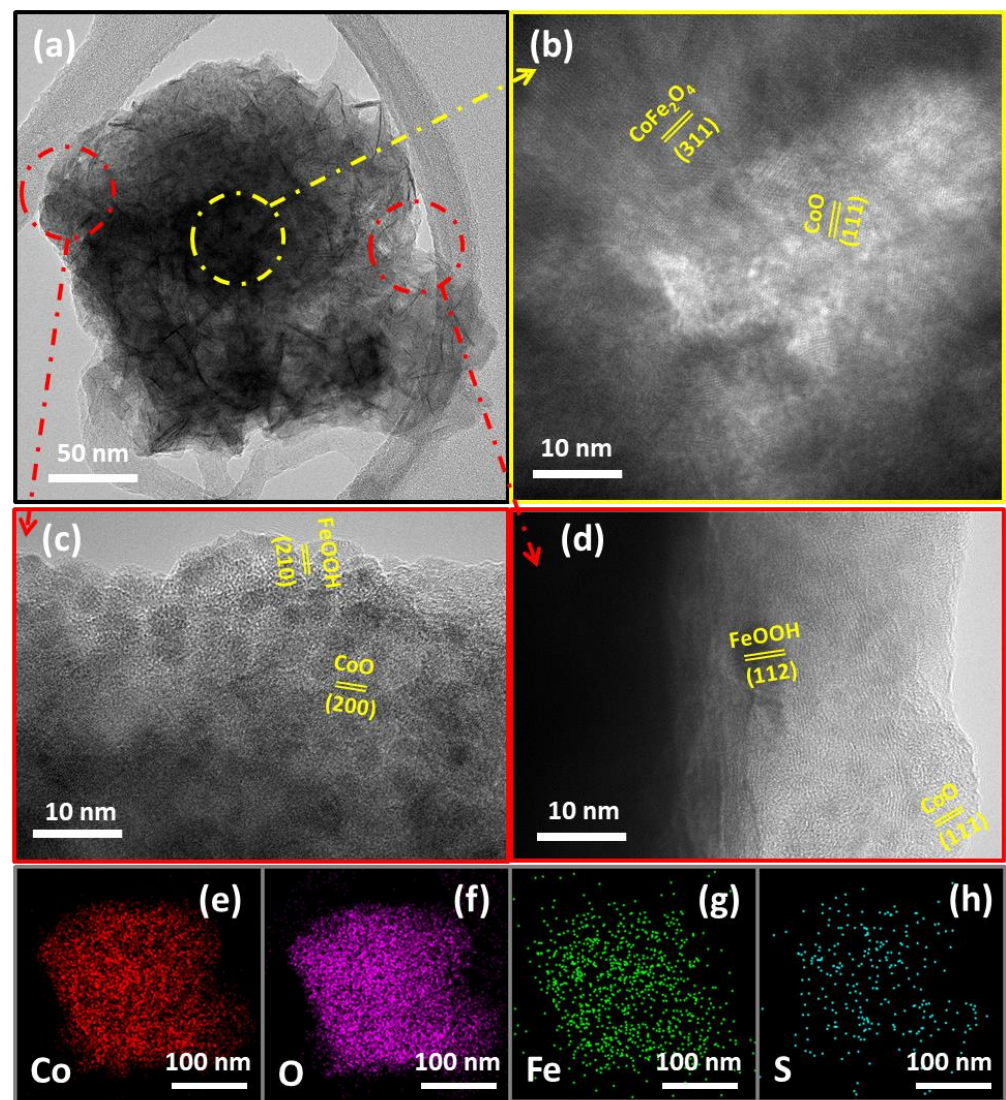


Figure S6. Morphology and structure characterizations of CoFeS₂@CoS₂/CNTs after stability test for 12 h. (a–d) TEM image and HRTEM images and (e–h) element maps.

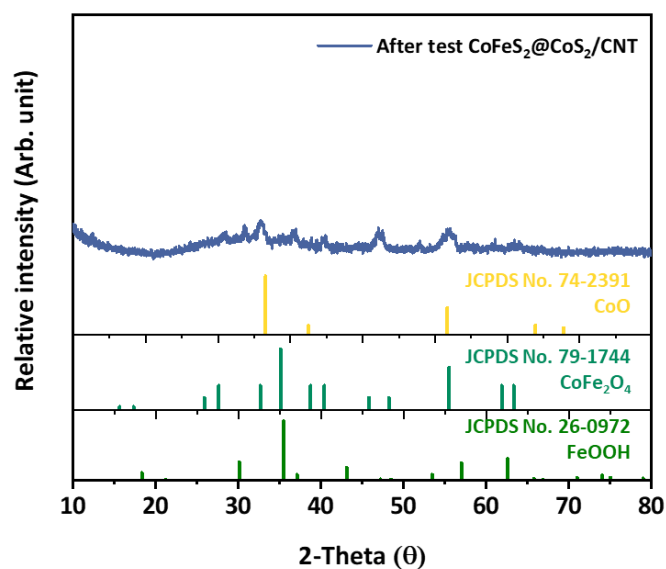


Figure S7. X-ray diffraction patterns of the CoFeS₂@CoS₂/CNTs after 12 h of OER.

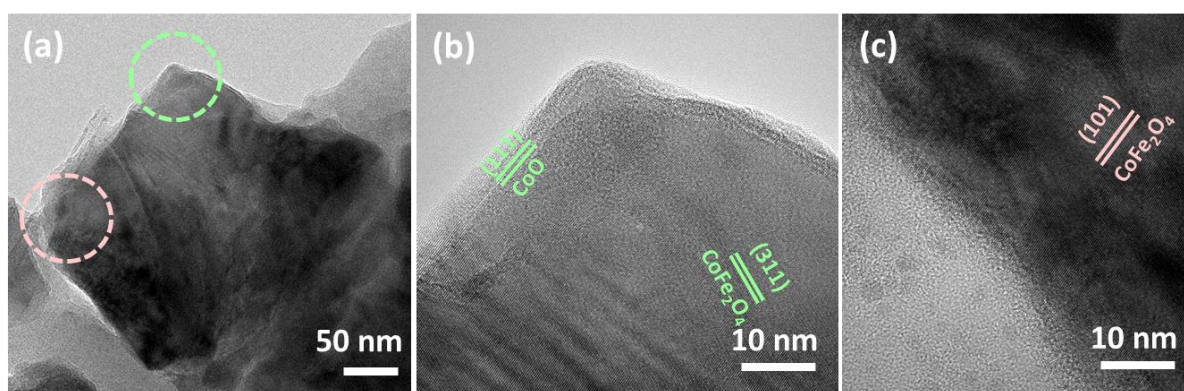


Figure S8. (a) TEM and (b–c) HRTEM images of the CoFeS₂@CoS₂/CNTs after 2000 cycles of ORR.

Table S1. Comparison of OER/ORR catalytic activity of CoFeS₂@CoS₂/CNTs with the recently reported Co, Fe-based catalysts.

Electrocatalyst	Electrolyte	Overpotential (@10 mA cm ⁻²)	ORR Onset potential	Tafel slope (mV dec ⁻¹)	Stability	Reference
This work	1.0 M KOH	269	0.976	19.68	12 h	
CoS ₂ microbox	1.0 M KOH	308	-	41.40	1000 cycled	S1
	0.5 M H ₂ SO ₄	278	-	73.00	1000 cycled	S2

Co-FeS ₂ /CoS ₂							
Fe ₇ S ₈ bulk	1.0 M KOH	380	-	96.00	-	S3	
NiCo-Phi/CNT	0.1 M KOH	400	0.75	117	20 h	S4	

References

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2. Wang, K.; Guo, W.; Yan, S.; Song, H.; Shi, Y. Hierarchical CoFeS₂/CoS₂ heterostructures as a superior bifunctional electrocatalyst. *RSC adv.* **2018**, *8*(50), 28684–28691.
3. Ni
4. Sathiskumar, C.; Alex, C.; John, N. S. Nickel cobalt phosphite nanorods decorated with carbon nanotubes as bifunctional electrocatalysts in alkaline medium with a high yield of hydrogen peroxide. *ChemElectroChem*. **2020**, *7*(8), 1935–1942.