

Supporting Information

Dual-Protected Co@PPD_rGO Core@Bishell Nanomaterials as an Efficient Bifunctional Electrocatalyst for Long-Life Rechargeable Zinc-Air Battery Ran Zhang, Junhao Lu, Ying Wu, Jinjin Zhao, Zhijuan Wang*

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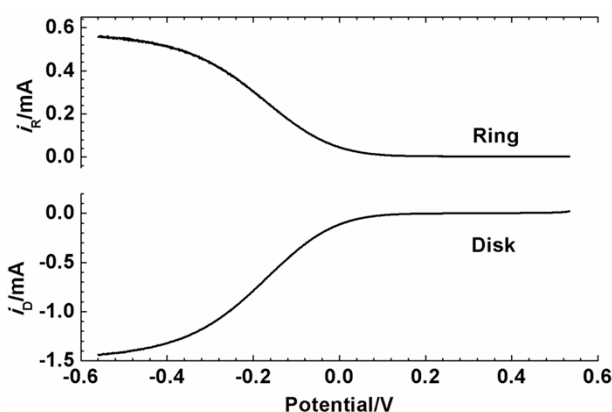


Figure S1. Ring ($\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$) and disk ($\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$) currents for the determination of collection efficiency of RRDE loaded with NC@GC catalyst. The electrolyte is degassed 0.1 M NaOH with 0.01 M $\text{K}_3\text{Fe}(\text{CN})_6$. The rotating rate of RRDE is 1,600 rpm. The collection efficiency is calculated to be $(38.8 \pm 0.2)\%$, close to the manufactures data 37%.

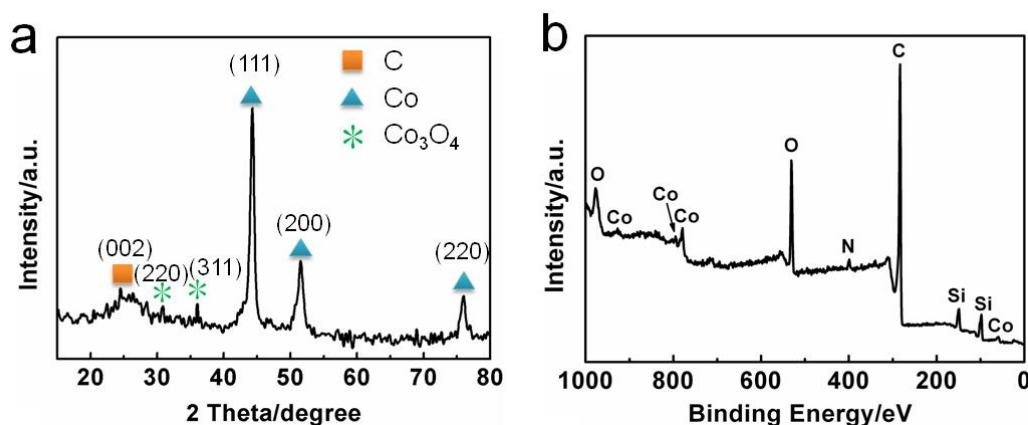


Figure S2. Powder X-ray diffraction (XRD) pattern (a) and X-ray photoelectron spectroscopy (XPS) full spectrum of Co@ Co_3O_4 @PPD (b).

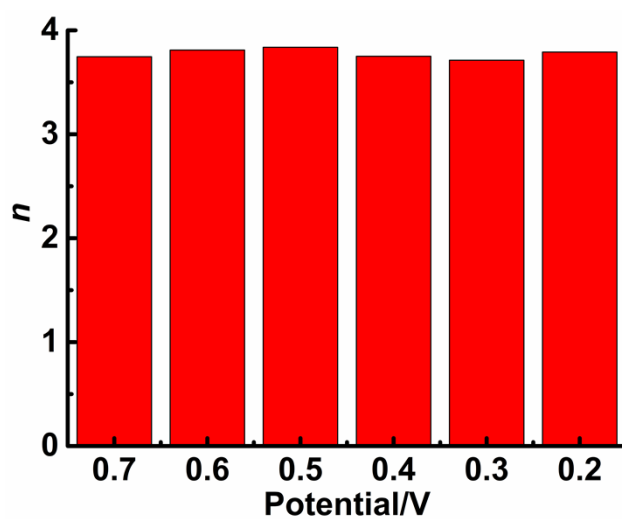


Figure S3. The transferred electron number of Co@PPD_rGO based on its Koutecky-Levich plot shown in Figure 4c.

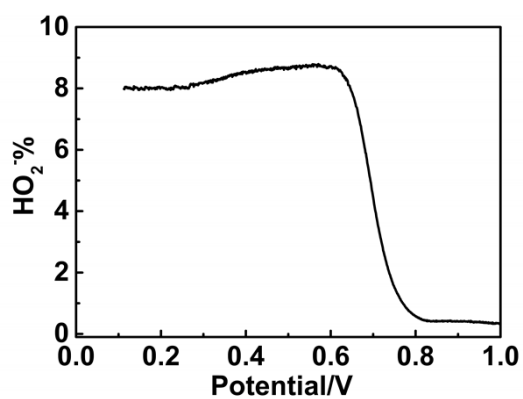


Figure S4. Calculation results of measured yield of HO₂⁻ using equation 4 (see experimental section in detail) based on RRDE result (Figure 4d).

Reference

1. Z. Wang, Y. Lu, Y. Yan, T. Y. P. Larissa, X. Zhang, D. Wu, H. Zhang, Y. Yang, X. Wang, *Nano Energy*, 2016, **30**, 368–378.