

### Supporting Information

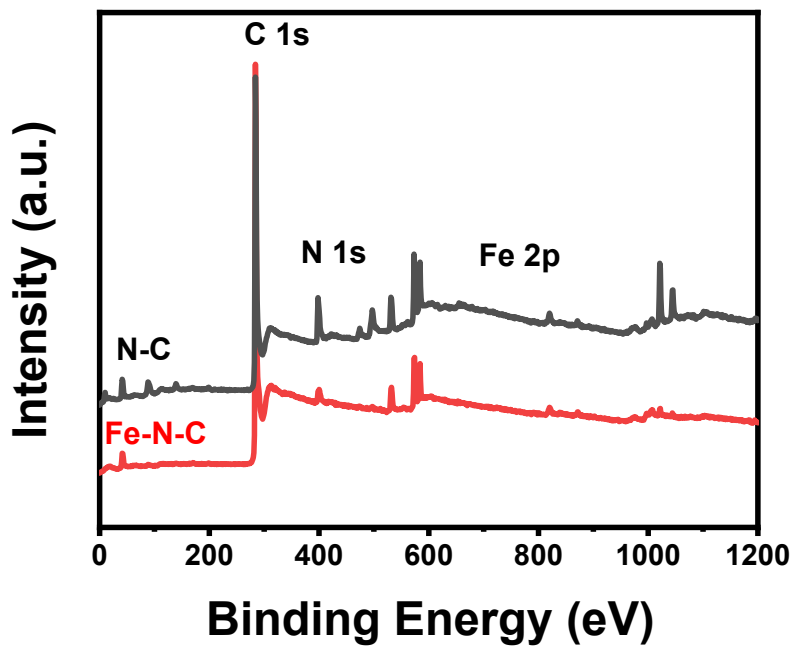
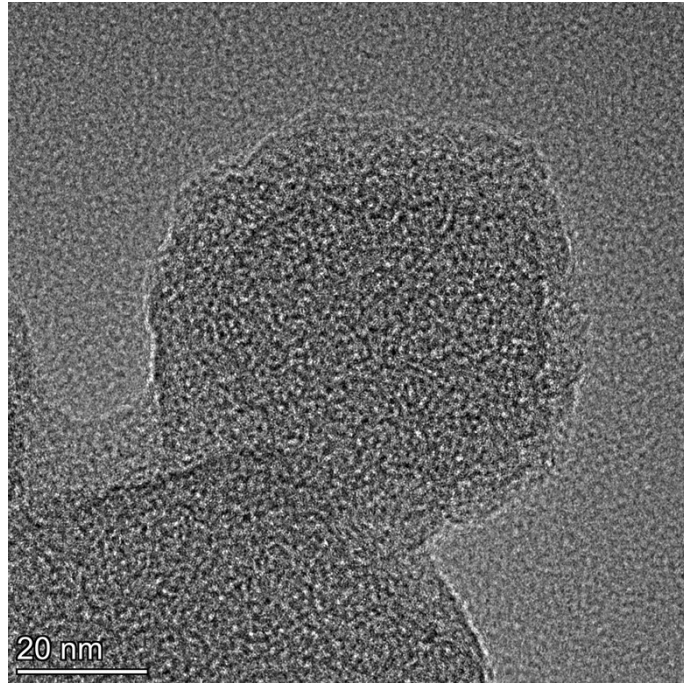


Figure S1. XPS survey of the Fe-N-C and N-C samples.



**Figure S2.** HRTEM image of the Fe-N-C sample.

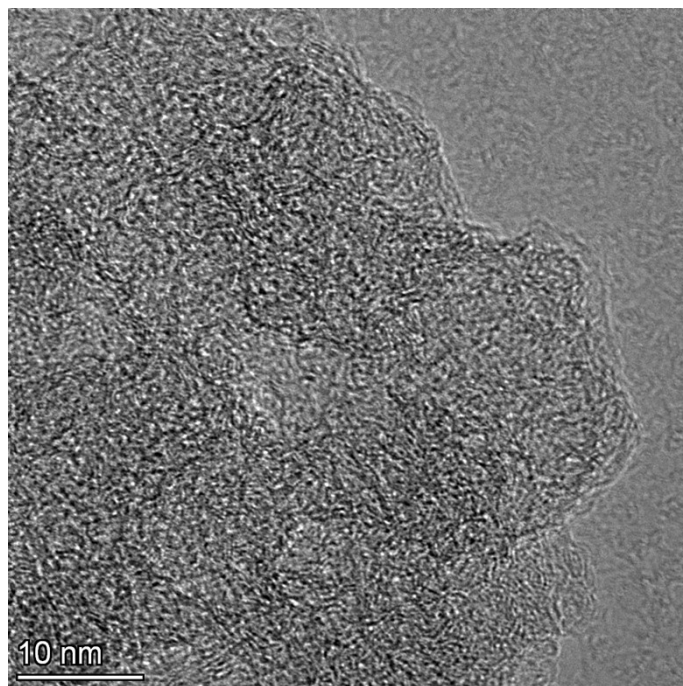


Figure S3. HRTEM image of the N-C sample.

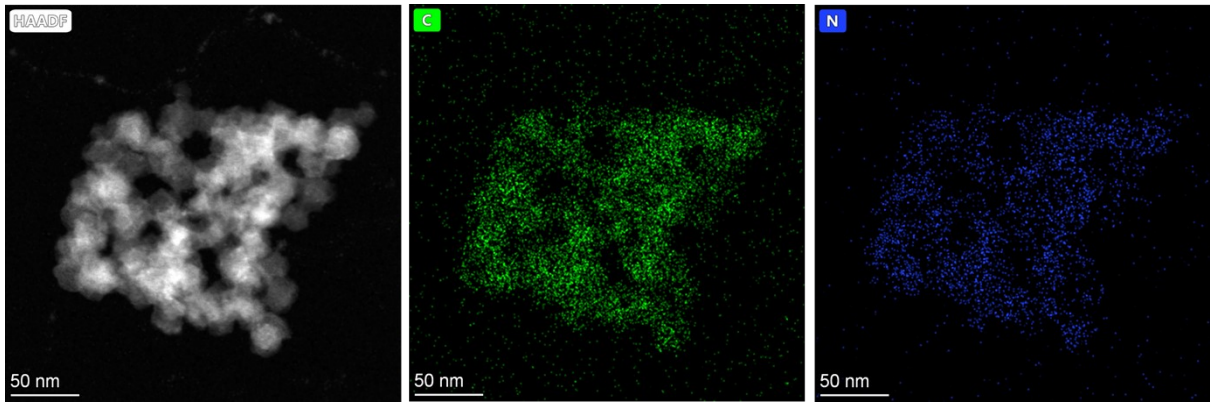


Figure S4. HAADF-STEM image and element mapping images of the N-C sample.

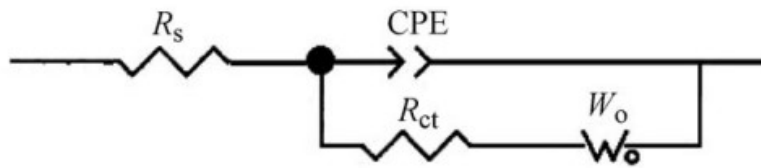


Figure S5. The equivalent circuit diagram for EIS of the samples.

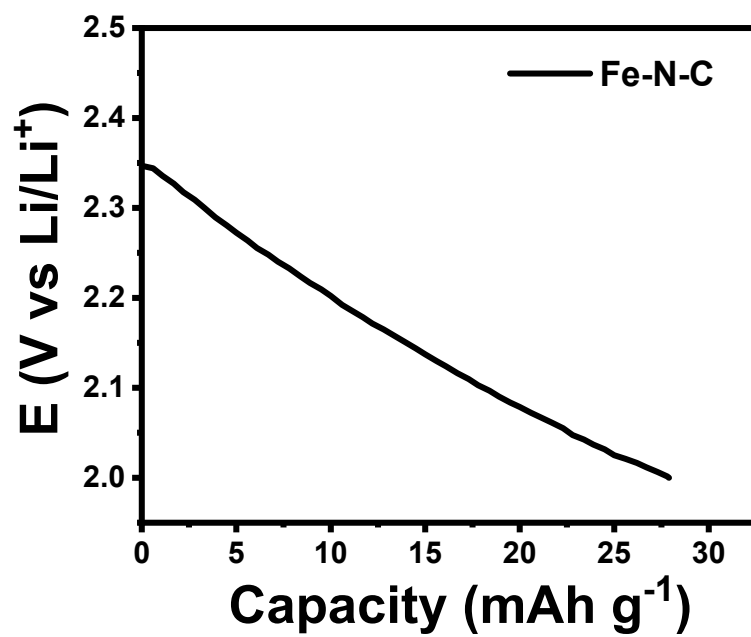


Figure S6. Discharge curve of the Fe-N-C cathode under Ar atmosphere (200 mA g<sup>-1</sup>).

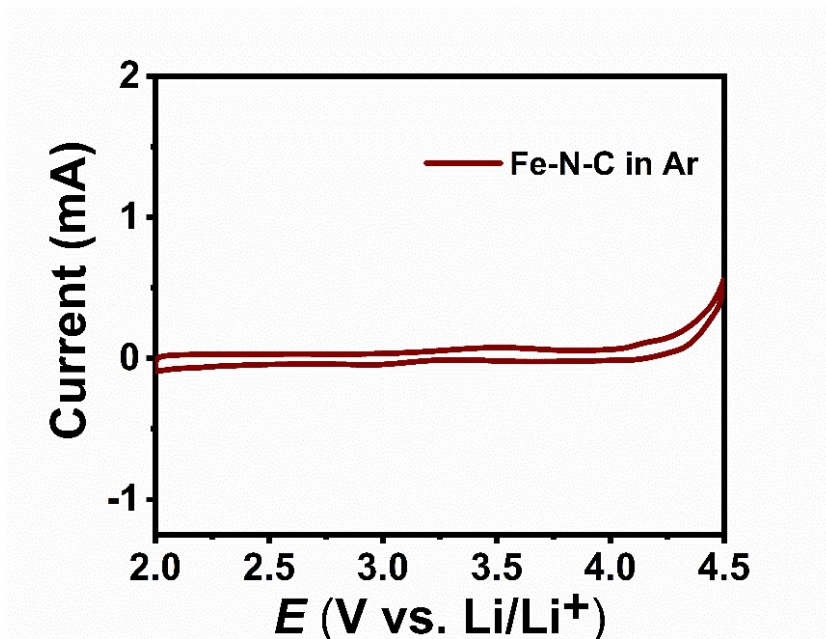


Figure S7. CV curve of the Fe-N-C cathode under Ar atmosphere.

**Table S1.** The performance comparison of the Li-CO<sub>2</sub> batteries with different reported catalysts.

Cathode Catalyst	Capacity (mAh g <sup>-1</sup> )	Cycle life (Current density)	References
Fe-N-C	13238 (0.2 A g <sup>-1</sup> )	140 cycles (0.2 A g <sup>-1</sup> )	This work
AuNPs/CNTs	6399 (0.1 A g <sup>-1</sup> )	46 cycles (0.2 A g <sup>-1</sup> )	1
Co-N-CNTs	6042 (0.2 A g <sup>-1</sup> )	92 cycles (0.4 A g <sup>-1</sup> )	2
RuO <sub>2</sub> /LDO	5455 (0.1 A g <sup>-1</sup> )	60 cycles (166 mA g <sup>-1</sup> )	3
BN-GN vdWsh	14319 (0.1 A g <sup>-1</sup> )	70 cycles (0.1 A g <sup>-1</sup> )	4
Cu-NG	14864 (0.2 A g <sup>-1</sup> )	50 cycles (0.2 A g <sup>-1</sup> )	5
GNPs/ $\beta$ -Mo <sub>2</sub> C	14000 (0.1 A g <sup>-1</sup> )	17 cycles (0.1 A g <sup>-1</sup> )	6
Mn <sub>2</sub> O <sub>3</sub> -Mn <sub>3</sub> O <sub>4</sub>	19024 (0.1 A g <sup>-1</sup> )	69 cycles (0.1 A g <sup>-1</sup> )	7
Ru@super P	8299 (0.1 A g <sup>-1</sup> )	80 cycles (0.1 A g <sup>-1</sup> )	8
Ru-Cu-G	13698 (0.2 A g <sup>-1</sup> )	100 cycles (0.2 A g <sup>-1</sup> )	9
CNT@RuO <sub>2</sub>	2187 (0.05 A g <sup>-1</sup> )	30 cycles (0.1 A g <sup>-1</sup> )	10
Ir/C Nanofiber	18813 (0.1 A g <sup>-1</sup> )	120 cycles (20 $\mu$ A)	11
MnCO <sub>3</sub>	11110 (0.05 A g <sup>-1</sup> )	25 cycles (0.2 A g <sup>-1</sup> )	12
Mn <sub>2</sub> (dobdc)	18022 (0.05A g <sup>-1</sup> )	50 cycles (0.2 A g <sup>-1</sup> )	13
Porous Mn <sub>2</sub> O <sub>3</sub>	9434 (0.05 A g <sup>-1</sup> )	45 cycles (0.05 A g <sup>-1</sup> )	13
adjacent Co/GO	17358 (0.1 A g <sup>-1</sup> )	100 cycles (0.1 A g <sup>-1</sup> )	14
N-CNTs@Ti	9292 (0.05 A g <sup>-1</sup> )	25 cycles (0.05 A g <sup>-1</sup> )	15
CNTs	8379 (0.05 A g <sup>-1</sup> )	29 cycles (0.1 A g <sup>-1</sup> )	16
GN	5139 (0.05 A g <sup>-1</sup> )	20 cycles (0.05 A g <sup>-1</sup> )	17
Ru/ACNFs	11495 (0.1 A g <sup>-1</sup> )	50 cycles (0.1 A g <sup>-1</sup> )	18
Mo <sub>2</sub> C/CNT cloth	3415 (50 $\mu$ A cm <sup>-2</sup> )	20 cycles (100 $\mu$ Ah cm <sup>-2</sup> )	19

## References

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