

Supplementary Information

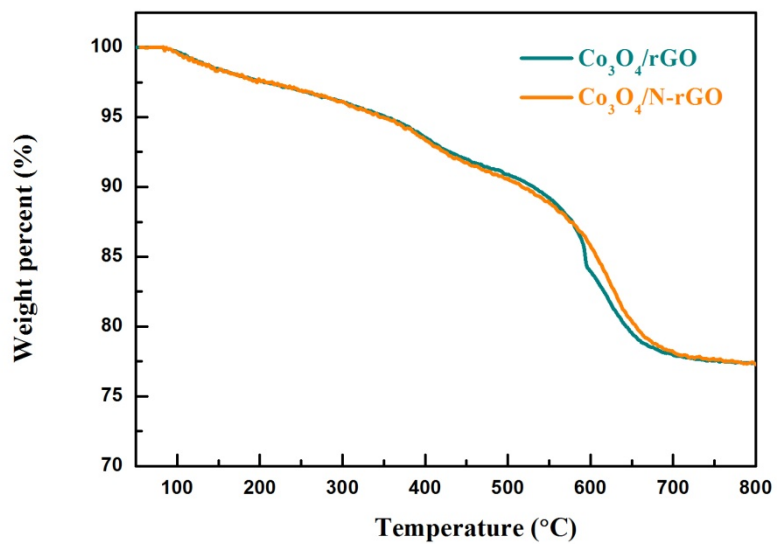


Fig. S1. TGA curves of $\text{Co}_3\text{O}_4/\text{rGO}$ and $\text{Co}_3\text{O}_4/\text{N-rGO}$.

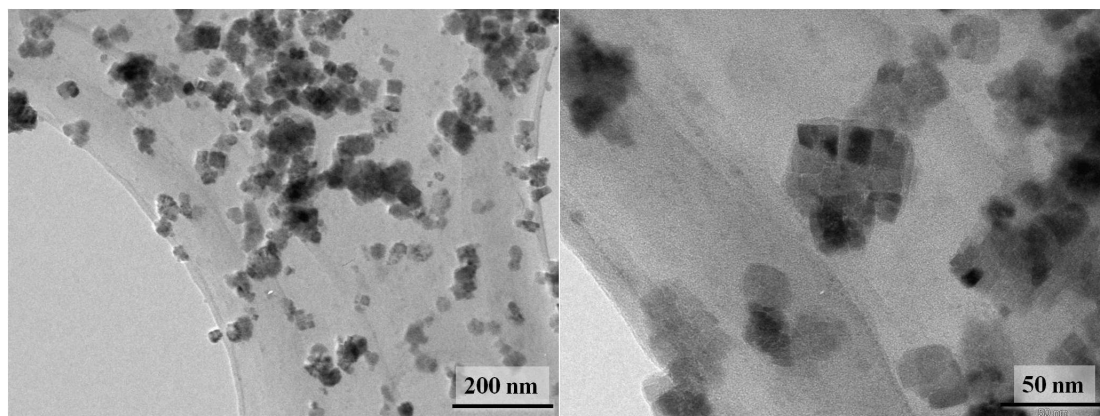


Fig. S2. TEM images of bare Co_3O_4 .

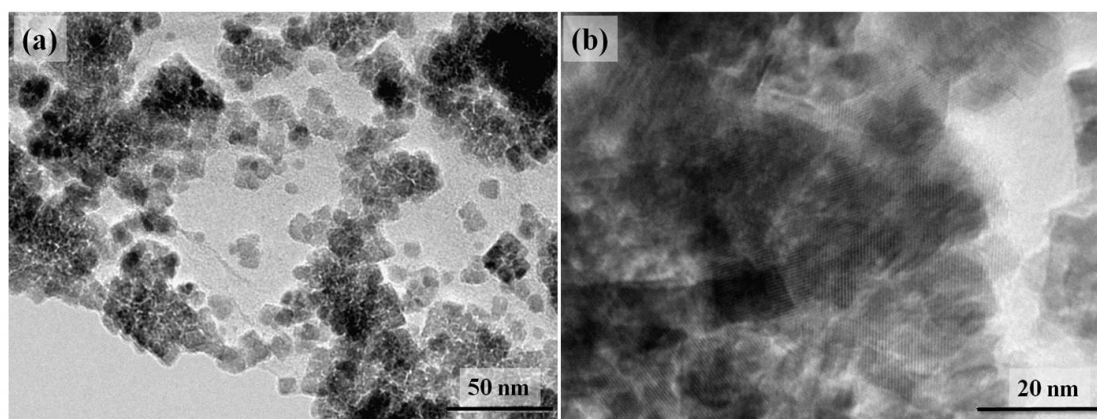


Fig. S3. (a) TEM and (b) HRTEM images of the obtained Co₃O₄/rGO composite.

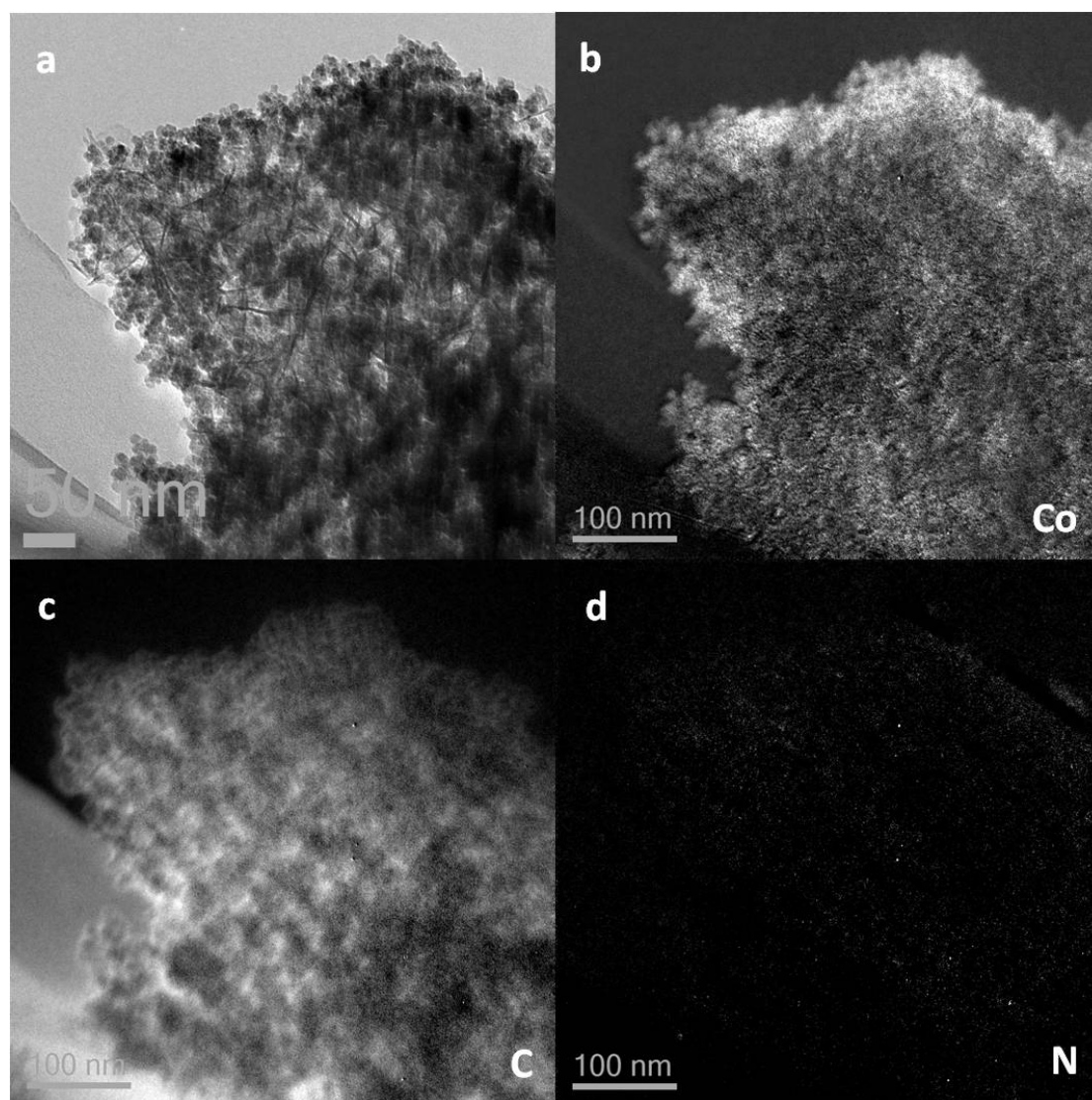


Fig. S4 Elemental mapping of Co₃O₄/N-rGO. The elemental Co (b), C (c) and N (d) maps generated by EELS mapping of the TEM micrograph shown in (a).

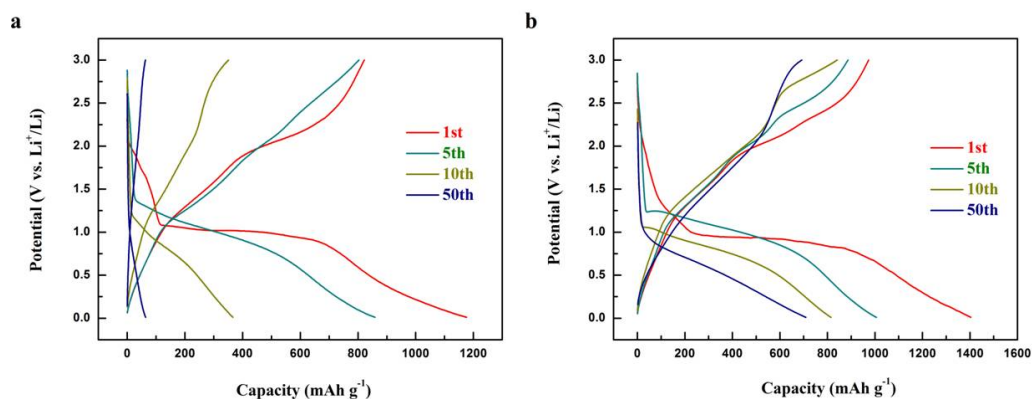


Fig. S5. Galvanostatic charge-discharge profiles of (a) Co_3O_4 and (b) $\text{Co}_3\text{O}_4/\text{rGO}$ for the 1st, 5th, 10th, and 50th cycles.

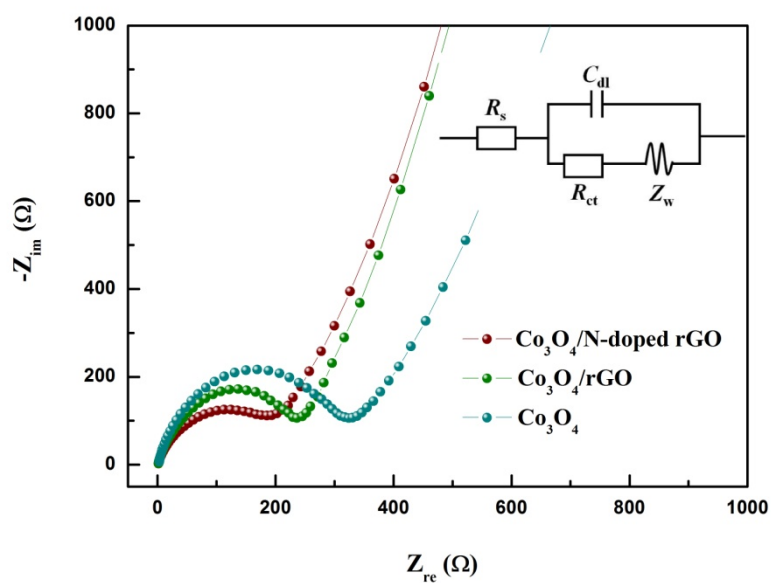


Fig. S6. Nyquist plots of the bare Co_3O_4 , $\text{Co}_3\text{O}_4/\text{rGO}$, and $\text{Co}_3\text{O}_4/\text{N-rGO}$. The upper right inset shows the equivalent circuit of the electrode.

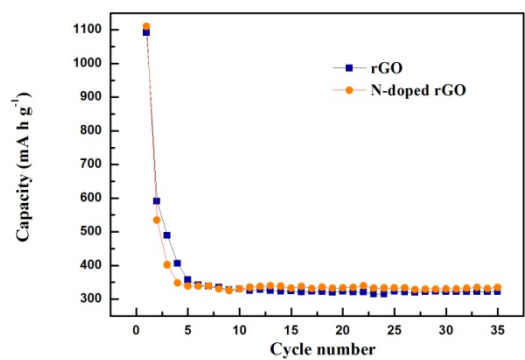


Fig. S7. Comparison of the cycling performance of rGO and N-rGO at a current density of 100 mA g⁻¹.

To further understand the improved electrochemical performance after nitrogen doping on graphene, we have tested rGO and N-rGO under the same experimental conditions and the results reveal a gradual decline in the specific capacity with increasing charge/discharge cycle number of rGO. For N-rGO, there is a capacity of ~8 mA g⁻¹, higher than for rGO after 10 cycles, and the cycling performance is slightly more stable than that of rGO. Comparing the capacity difference between Co₃O₄/N-rGO and Co₃O₄/rGO, the improved capacity can be attributed to the synergistic effects of doped nitrogen between rGO and Co₃O₄ between N-rGO.

Table S1 Fitting results of the impedance parameters.

Sample	R _e (Ω)	R _{ct} (Ω)	C _{dl} (μF)
bare Co ₃ O ₄	3.58	323	0.434
Co ₃ O ₄ /rGO	2.31	250	1.20
Co ₃ O ₄ /N-rGO	2.23	204	1.32

Table S2 Comparison of electrochemical performances with references.

Published work			This work	
	Current density (mA g ⁻¹)	Capacity (mA h g ⁻¹)	Current density (mA g ⁻¹)	Capacity (mA h g ⁻¹)
Hsien ⁴⁵	89	870	100	1100
	445	760	400	860
	890	690	1000	670
Wang ⁴⁴	74.4	900	100	1100
Yang ⁴⁶	200	820	200	958
	500	560	400	860
	1000	390	1000	670
	2000	264	2000	462
Zhu ⁴⁷	180	~ 850 (at the 6 nd cycle)	400	882.2 (at the 6 nd cycle)
		~780 (at the 50 th cycle)		766.4 (at the 50 th cycle)
Li ³⁸	200	~ 910 (at the 6 nd cycle)	400	882.2 (at the 6 nd cycle)
		~840 (at the 50 th cycle)		766.4 (at the 50 th cycle)