

Supporting information

3-Dimensional Porous N-doped Graphene Foam as Non-Precious Catalysts for Oxygen Reduction Reaction

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The peroxide percentage ($H_2O_2\%$) was determined from RRDE measurements based on the disk current (I_d) and ring current (I_r) via the following equation:

$$H_2O_2\% = 100 \times \frac{2I_r / N}{I_d + I_r / N}$$

The electron transfer number (n) was based on the following equation:

$$5n = \frac{4I_d}{I_d + I_r / N}$$

where $N = 0.36$ is the current collection efficiency of Pt ring, which is calibrated in 0.1M KOH with a 10 mM $K_3Fe(CN)_6$ electrolyte.

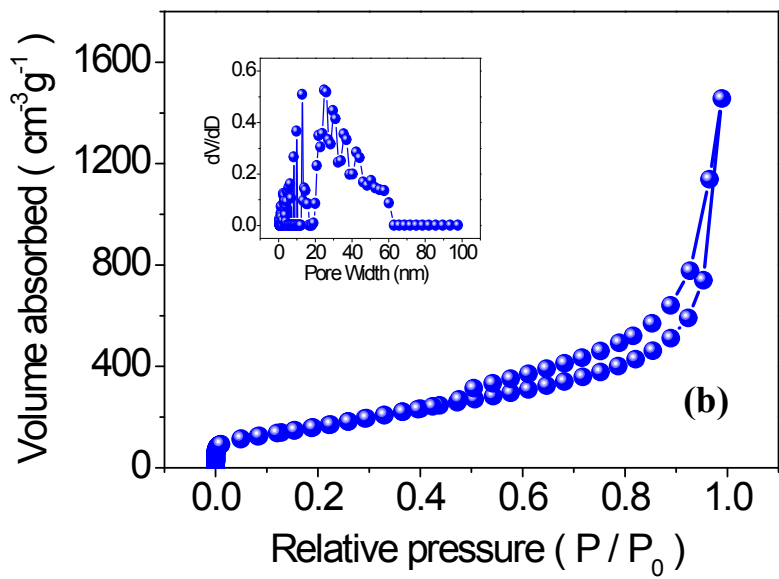
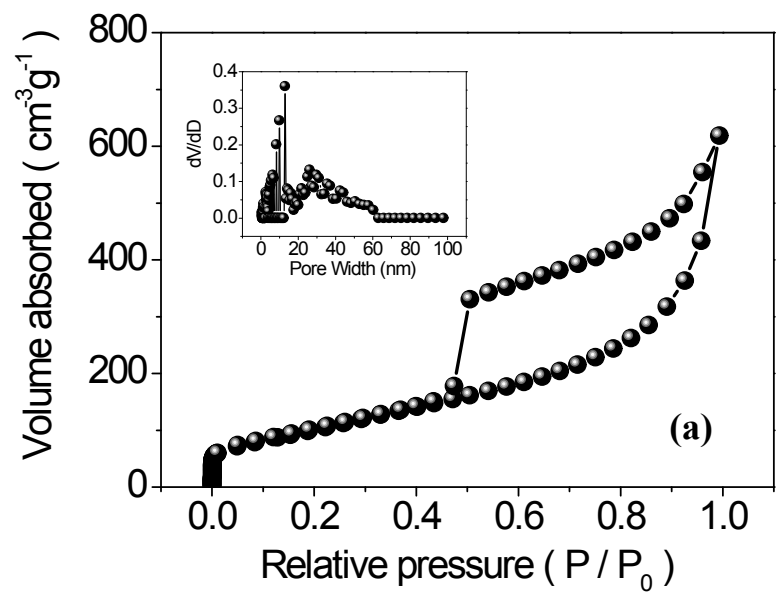


Figure S1. N_2 adsorption/desorption isotherms of (a) NG, (b) PNG. The insert is the pore size distribution.

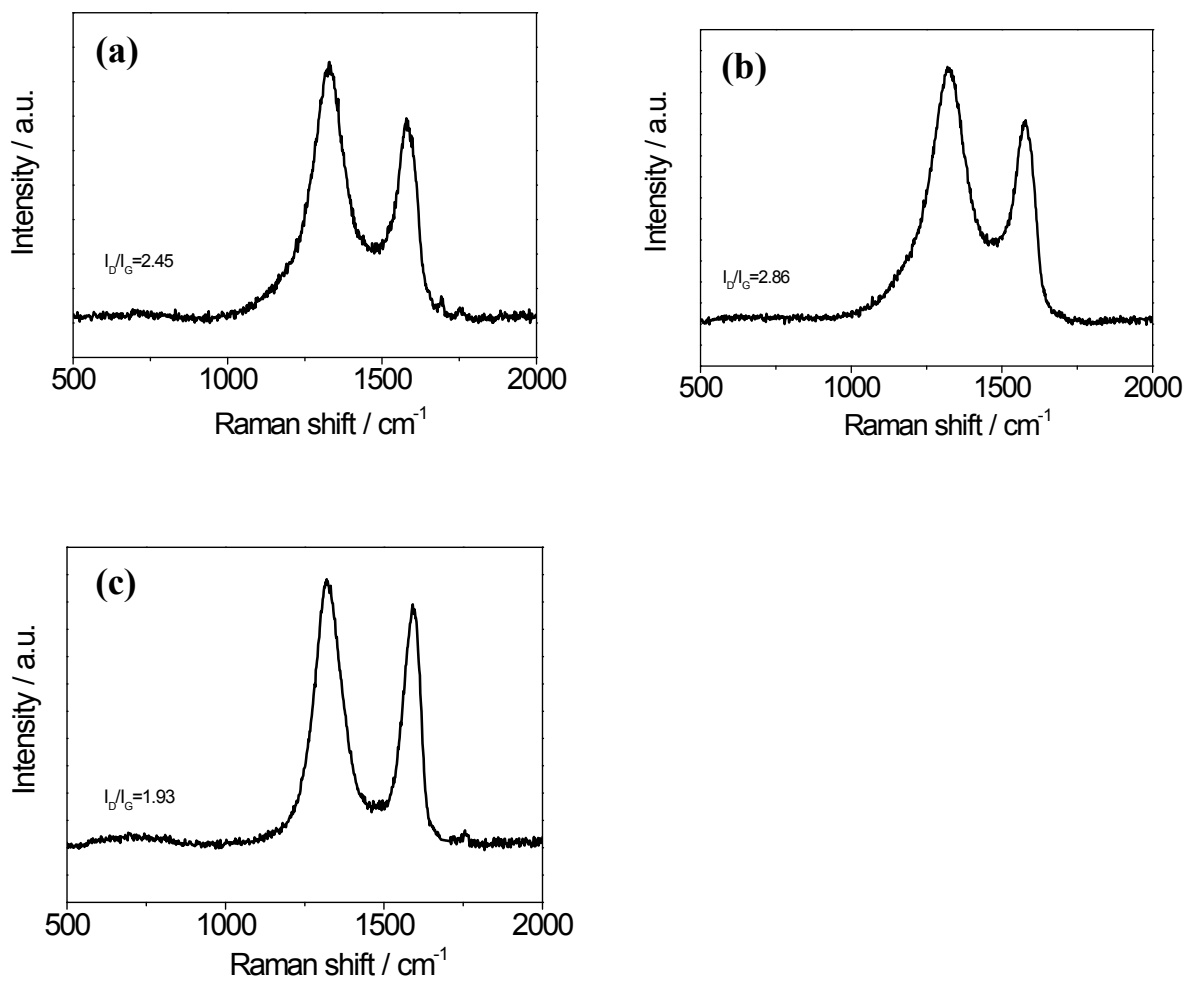


Figure S2. Raman spectra of (a) NG, (b) PNG, (c) GO.

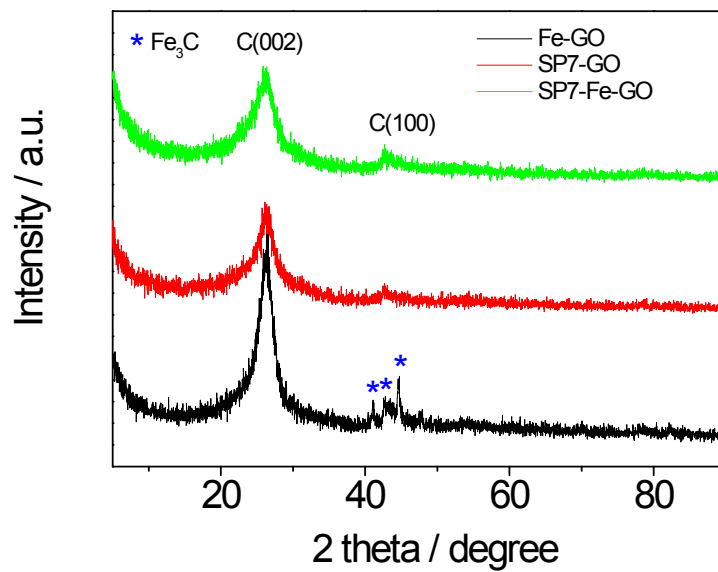


Figure S3. X-ray diffraction (XRD) of NG, PNG and PNGF, respectively.

Figure S3 shows the XRD patterns of different samples. Two broad signals of centred at 26.3° and 42.6° can be assigned to the diffraction peak of graphitic carbon. Due to the low content of iron and large noise of XRD signals, it is hard to distinguish the phase of Fe element in the PNGF. Interestingly, The XRD spectra confirm the presence of a Fe_3C phase in the NG.

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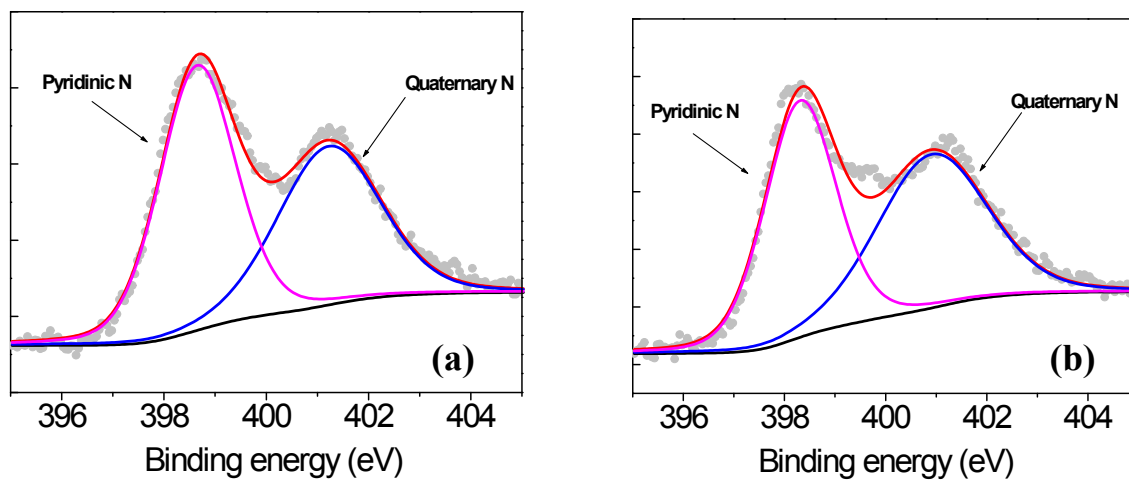


Figure S4. High resolution N1s XPS spectra of (a) NG, (b) PNG.

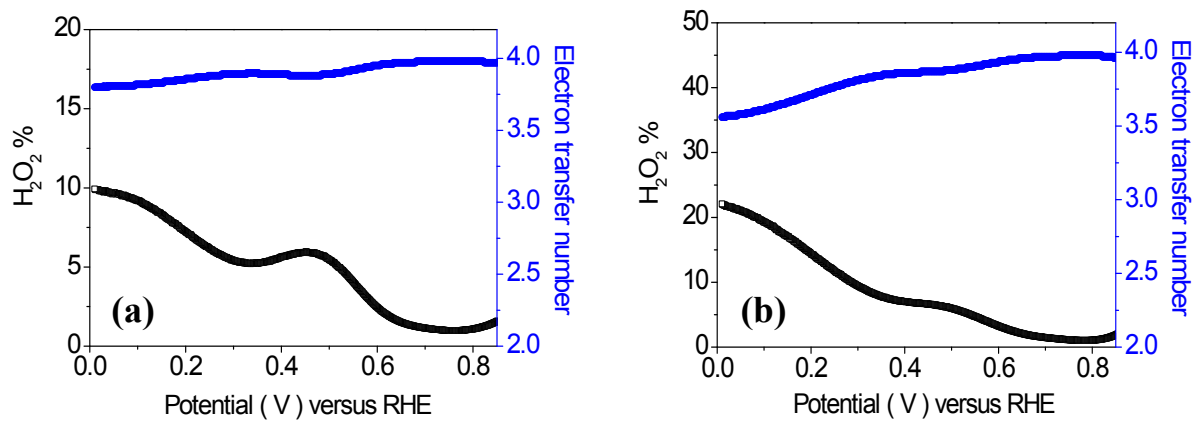


Figure S5. The percentage of H₂O₂ produced and electron transfer number of (a) NG, (b) PNG in O₂-saturated 0.1 M KOH (1600 rpm).

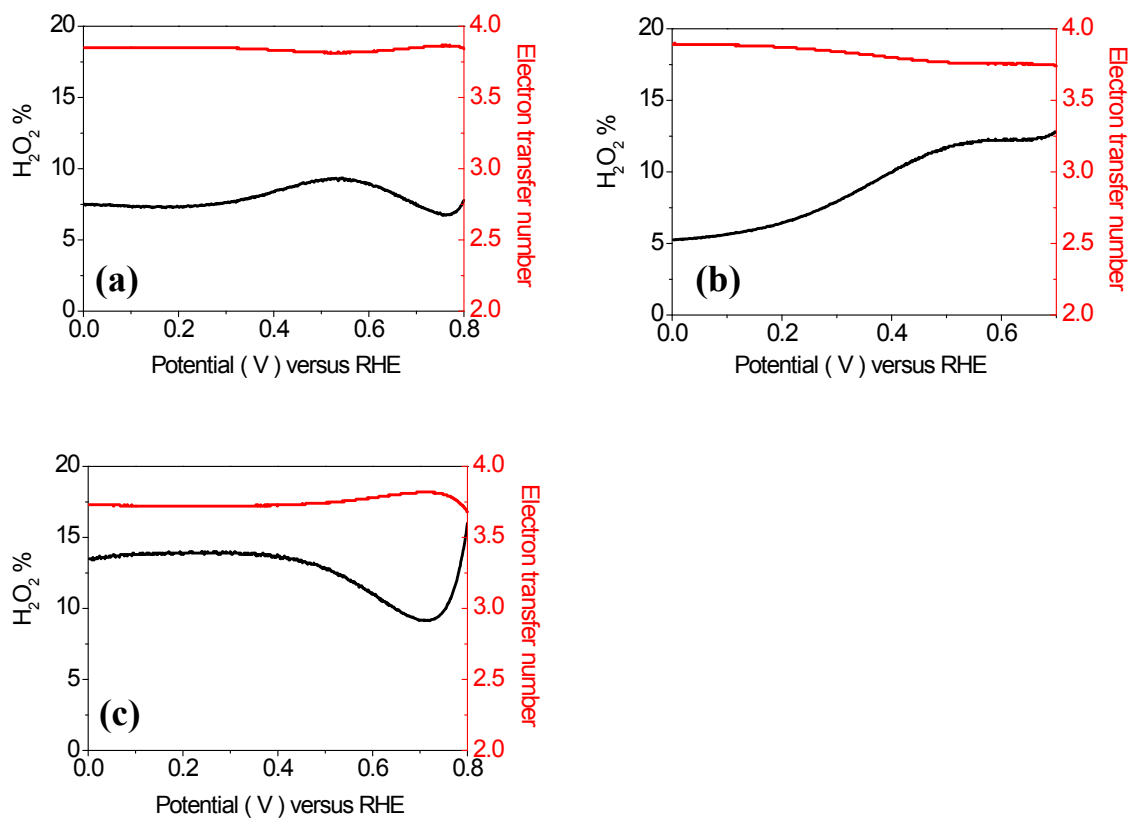


Figure S6. The percentage of H₂O₂ produced and electron transfer number of (a) PNGF, (b) PNG, (c) NG in O₂-saturated 0.1 M HClO₄ (1600 rpm).

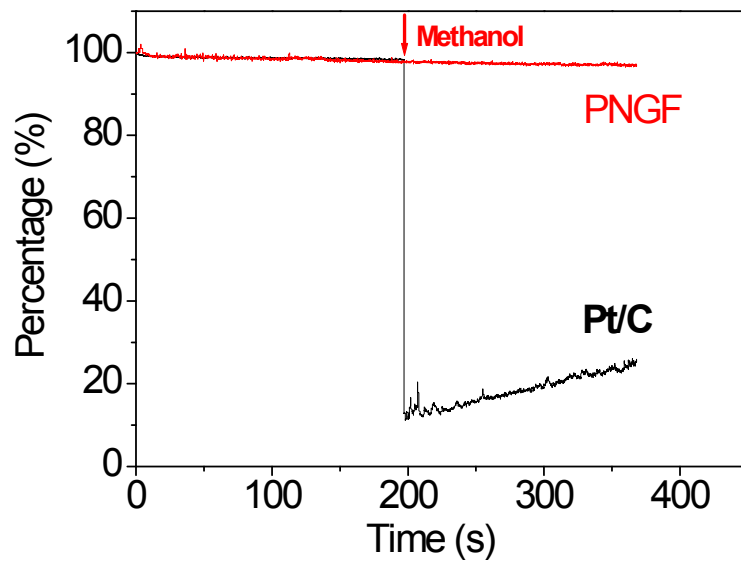


Figure S7. Chronoamperometric responses of PNGF and Pt/C at 0.6 V in O₂-saturated 0.1 M HClO₄ followed by addition of 3M methanol.

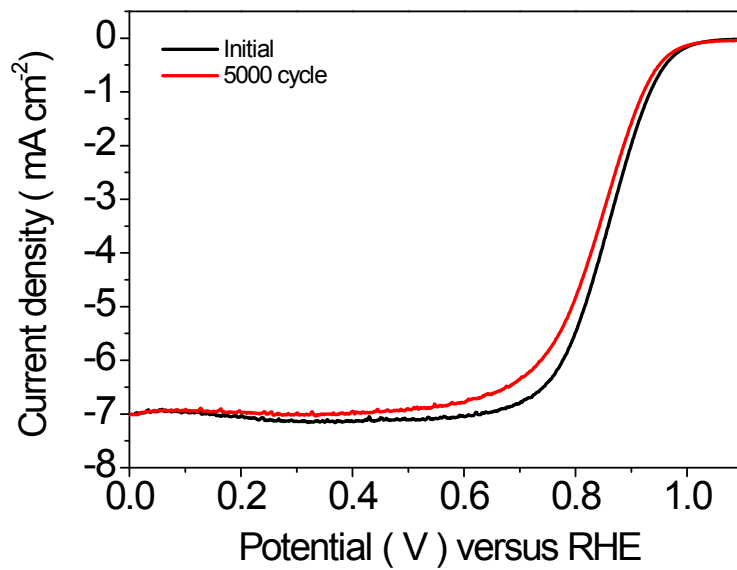


Figure S8. Linear sweep voltammograms of PNGF on a rotating disk electrode (1600 rpm) before and after 5000 cycles in O₂-saturated 0.1M KOH at a scan rate of 5 mV s⁻¹.

Table S1. Atomic content of all the catalysts calculated from the XPS survey spectra.

Catalyst	C content (at.%)	O content (at.%)	N content (at.%)	Pyridinic N	Graphitic N	Ratio (Graphitic/PyridinicN)
PNGF	92.0	2.93	5.07	55.9%	44.1%	0.79
PNG	90.92	2.45	6.64	50.2%	49.8%	0.99
NG	91.71	2.82	5.47	55.2%	44.8%	0.81