

Electronic Supplementary Information (ESI)

A three-dimensional nitrogen-doped graphene aerogel-activated carbon composite catalyst that enables low-cost microfluidic microbial fuel cells with superior performance

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Supplementary Figures and Tables

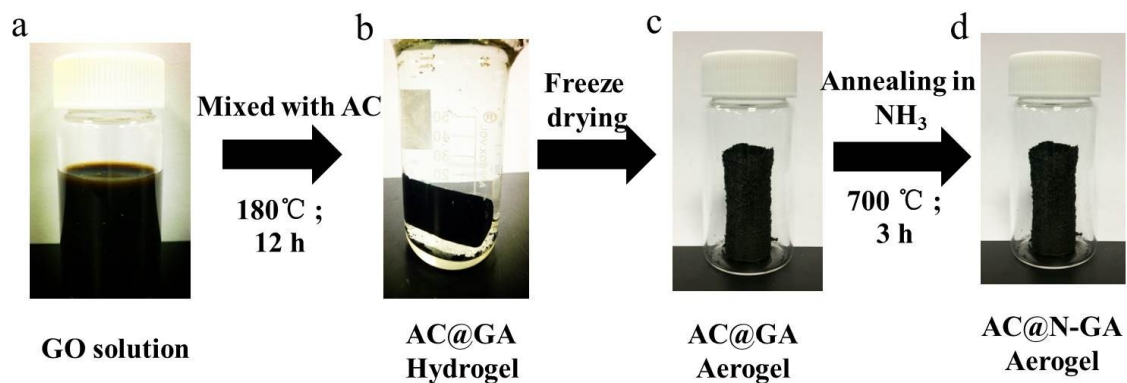


Fig.S1 Fabrication process of ORR catalysts (AC@N-GA).

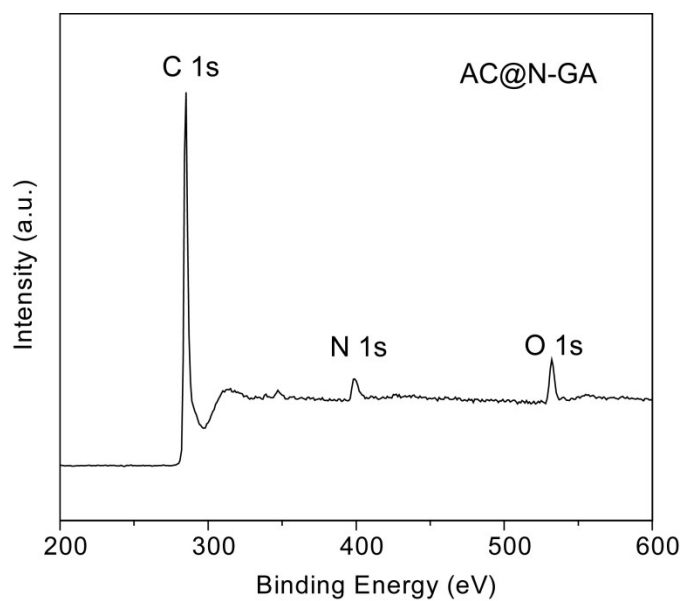


Fig.S2 XPS survey spectrum collected for AC@N-GA.

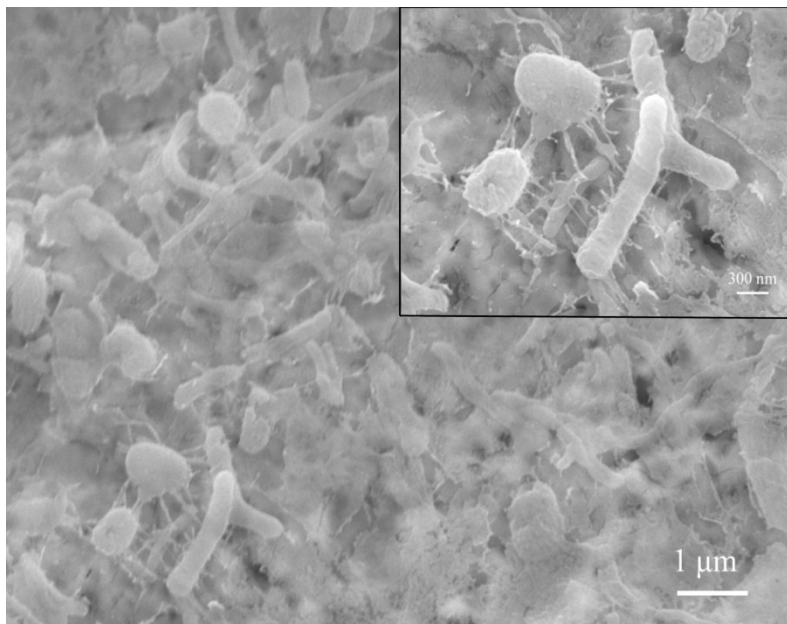


Fig.S3 Bacterial aggregation on the air-cathode. The inset shows the enlarged view of bacteria cells.

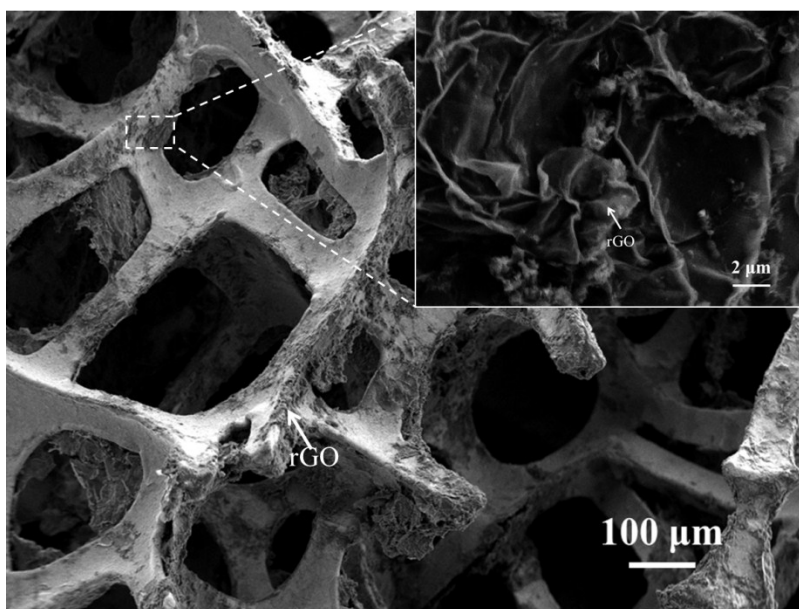


Fig.S4 The morphology of plain rGO@Ni scaffold without bacterial inoculation. The inset shows the enlarged view of square region.

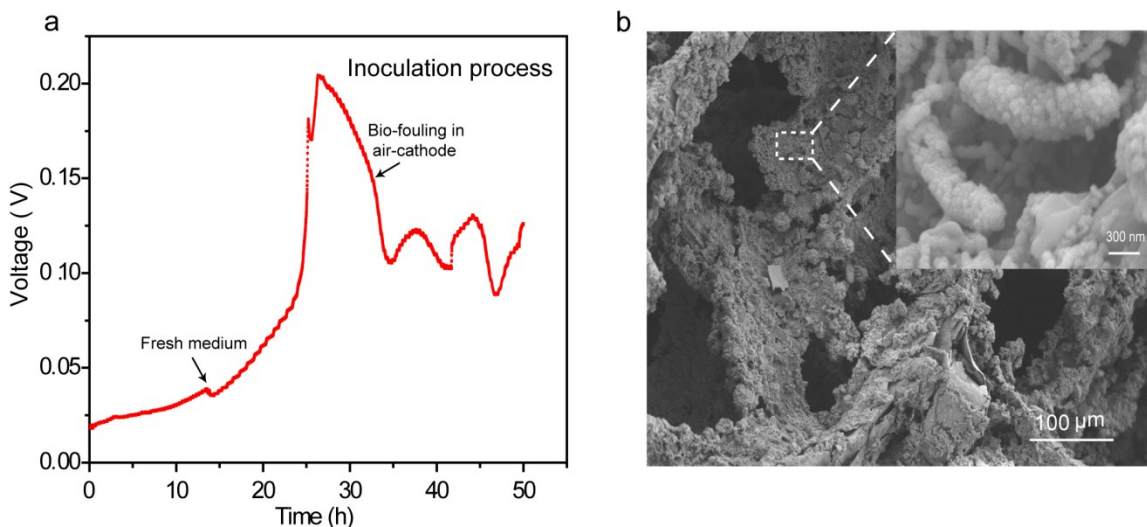


Fig.S5 (a) Time course of cell voltage during inoculation process; (b) surface morphologies after successful inoculation at bioanode. The inset depicts the enlarged view of bacteria. Particles deposited on the bacterial cells are sputtered gold particles.

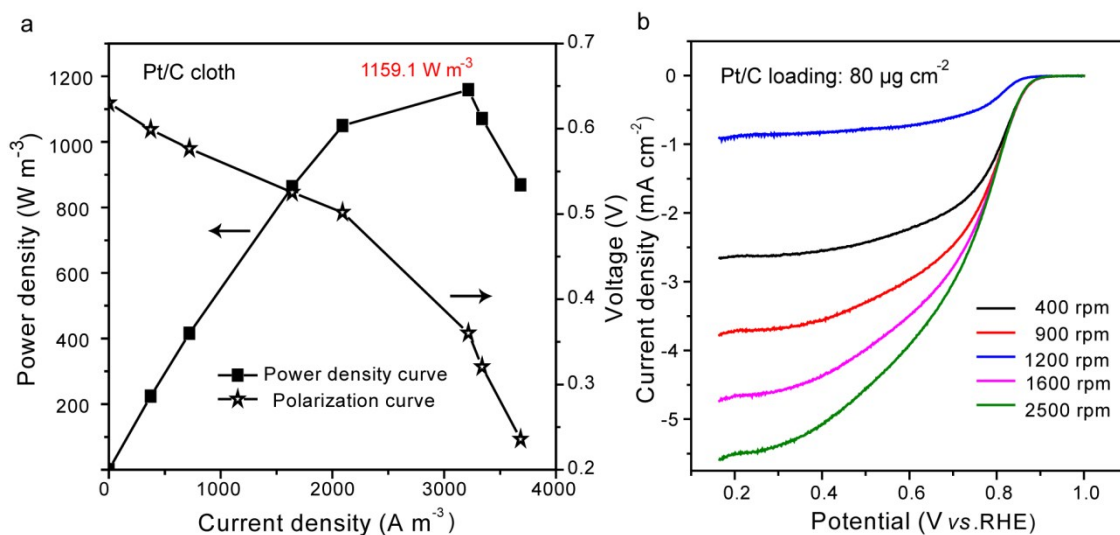


Fig.S6 (a) The volumetric power density and polarization curve of a μ MFC cell using Pt/C cloth and rGO@Ni as air-cathode and bio-anode, respectively. The chamber size is 50 μ L. (b) RRDE curves of Pt/C collected in O_2 -saturated 0.1 M KOH aqueous electrolyte.

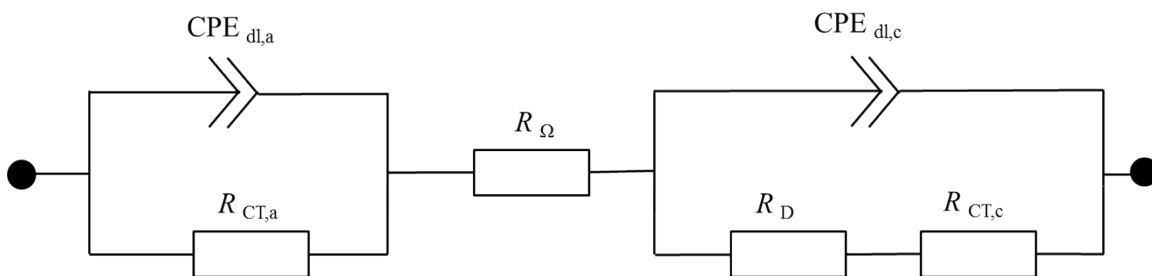


Fig.S7 Equivalent electric circuit used to fit the Nyquist plot. Abbreviations: R_{Ω} —ohmic resistance; $CPE_{dl,a}$ and $CPE_{dl,c}$ —constant phase element associated to the double layer at the surface of anode and cathode, respectively; $R_{CT,a}$ and $R_{CT,c}$ —charge transfer resistance of anode and cathode, respectively; R_D —mass transfer resistance at air-cathode.

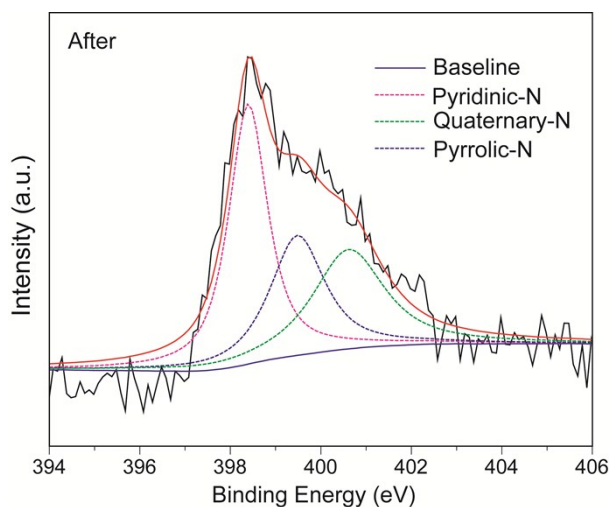


Fig.S8 N 1s XPS spectra of AC@N-GA after MFC running.

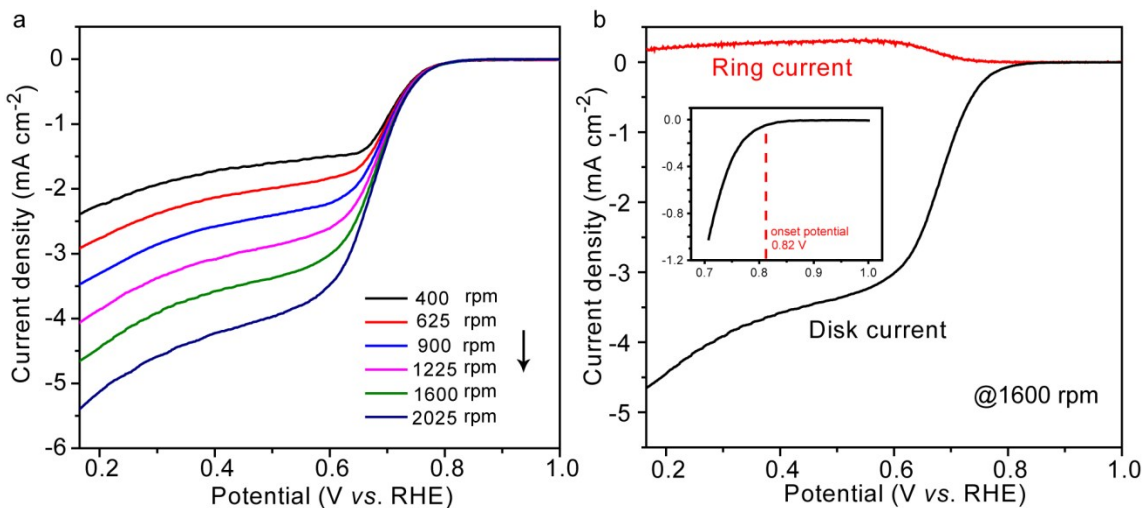


Fig.S9 Catalytic performance of the AC@N-GA catalyst after the long-term operation measured in O₂-saturated 0.1 M KOH aqueous electrolyte. (a) RRDE curves at various rotation speeds and (b) disk and ring current-potential (*I-V*) curves at a rotation speed of 1600 rpm. Inset shows the onset potential at 1600 rpm.

Table S1 Fitted parameters of elements in the equivalent electric circuit shown in Fig. S9.

	CPE _{dl,a}	R _{CT,a} /ohm	R _Ω /ohm	CPE _{dl,c}	R _{CT,c} /ohm	R _D /ohm
μMFC	0.001	11.3	14.6	0.012	447.2	227.5

Table S2 Elements content of AC@N-GA

	C 1s	N 1s	O 1s
Before test	89.81%	5.22%	4.97%
After test	85.24%	5.49%	9.27%