Electronic Supplementary Information

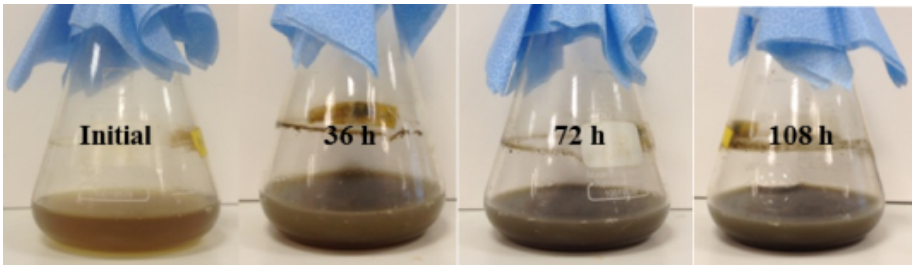

Fig. S1 Optical photographs of GO-bacteria mixture in culture medium at different cultivation time.

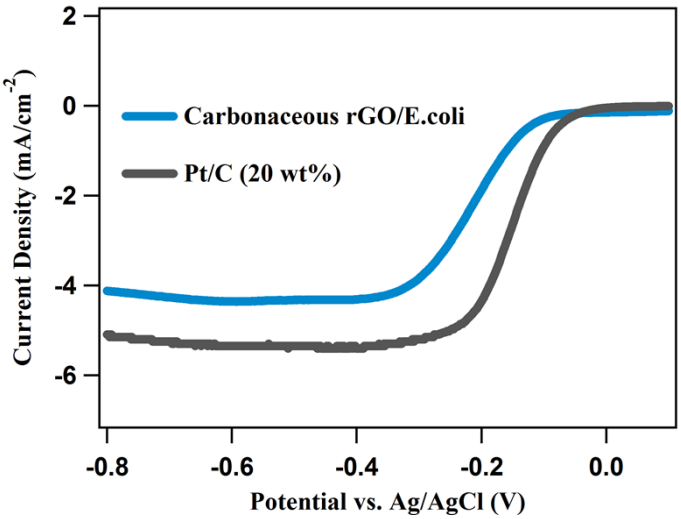

Fig. S2 LSV of carbonaceous rGO/ *E. coli* and commercial Pt/C (20 wt%) at roatation speed of 1600 rpm

Derivation of electron transfer number

The electron transfer number (n) of ORR is determined based on K-L equation: [1, 2]

$$1/I = 1/I_L + 1/I_K = 1/(B\omega^{1/2}) + 1/I_K$$

$$B=0.2nF(D_0)^{2/3}\nu^{-1/6}$$

Where I, I_L and I_K are the measured current density, diffusion limiting current density and kinetic-limiting current density, respectively; ω is the rotation speed in rpm; F is the Faraday constant (96485 C mol^{-1}); D_0 is the diffusion coefficient of oxygen in 0.1 M KOH (1.9×10^{-5} cm2 s^{-1}); ν is the kinetic viscosity (0.01 cm2 s^{-1}); and C_0 is the bulk concentration of oxygen in the solution (1.2×10^{-6} mol cm^{-3}).

Tafel Plot

For the Tafel plot, kinetic-limiting current density (I_K) is calculated based on mass-transport correction: $I_K=I \times I_L/(I_L-I)$. And the Tafel equation is given as $\eta=a + b\log I_k$, where η is the measured potential *vs.* Ag/AgCl.

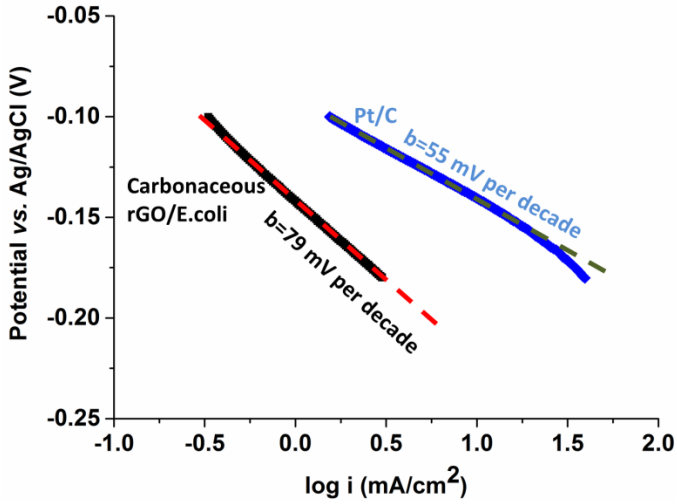

Fig. S3 Tafel plots of carbonaceous rGO/E.coli and Pt/C obtained at low currents and 1600 rpm, in 0.1 M KOH.

As shown in Figure S3, the Tafel slopes of carbonaceous graphene/*E.coli* and Pt /C are 79 and 55 mV per decade, respectively. Both values are comparable to the ideal theroretical value of 60 mV per decade for ORR catalyzed by Pt at room temperature. [3, 4]

References

1. I. Y. Jeon, H. J. Choi, S. M. Jung, J. M. Seo, M. J. Kim, L. M. Dai and J. B. Baek, *J Am Chem Soc*, 2013, **135**, 1386-1393.
2. F. X. Ma, J. Wang, F. B. Wang and X. H. Xia, *Chem Commun*, 2015, **51**, 1198-1201.
3. Y. G. Li, W. Zhou, H. L. Wang, L. M. Xie, Y. Y. Liang, F. Wei, J. C. Idrobo, S. J. Pennycook and H. J. Dai, *Nat Nanotechnol*, 2012, **7**, 394-400.
4. Y. Y. Liang, Y. G. Li, H. L. Wang, J. G. Zhou, J. Wang, T. Regier and H. J. Dai, *Nat Mater*, 2011, **10**, 780-786.