Supplementary Materials

Three-dimensional N, B-doped graphene aerogel as a synergistically enhanced metal-free catalyst for the oxygen reduction reaction

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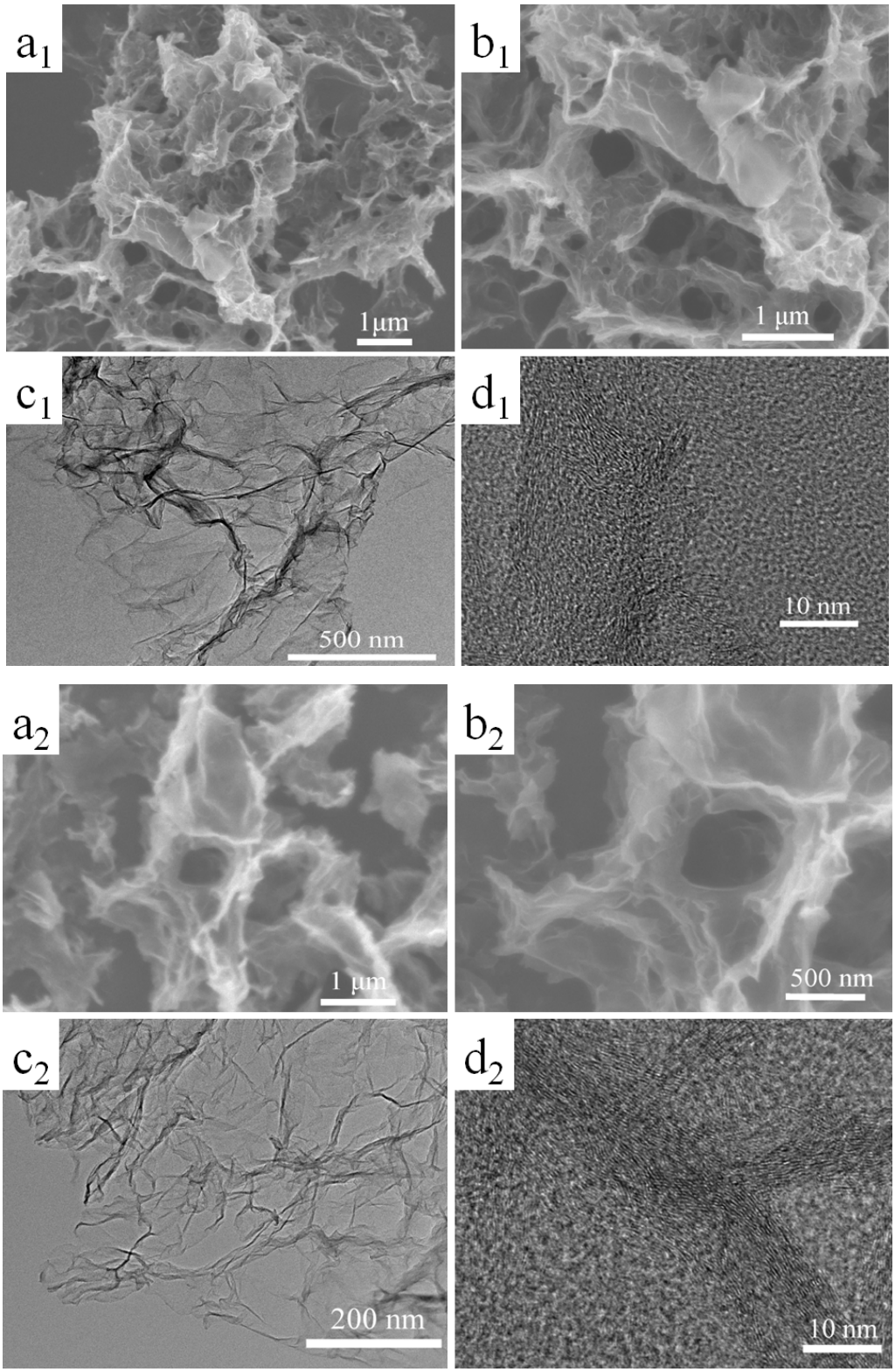

a1
1μm
b1
1 μm
c1
500 nm
d1
10 nm
a2
1 μm
b2
500 nm
c2
200 nm
d2
10 nm

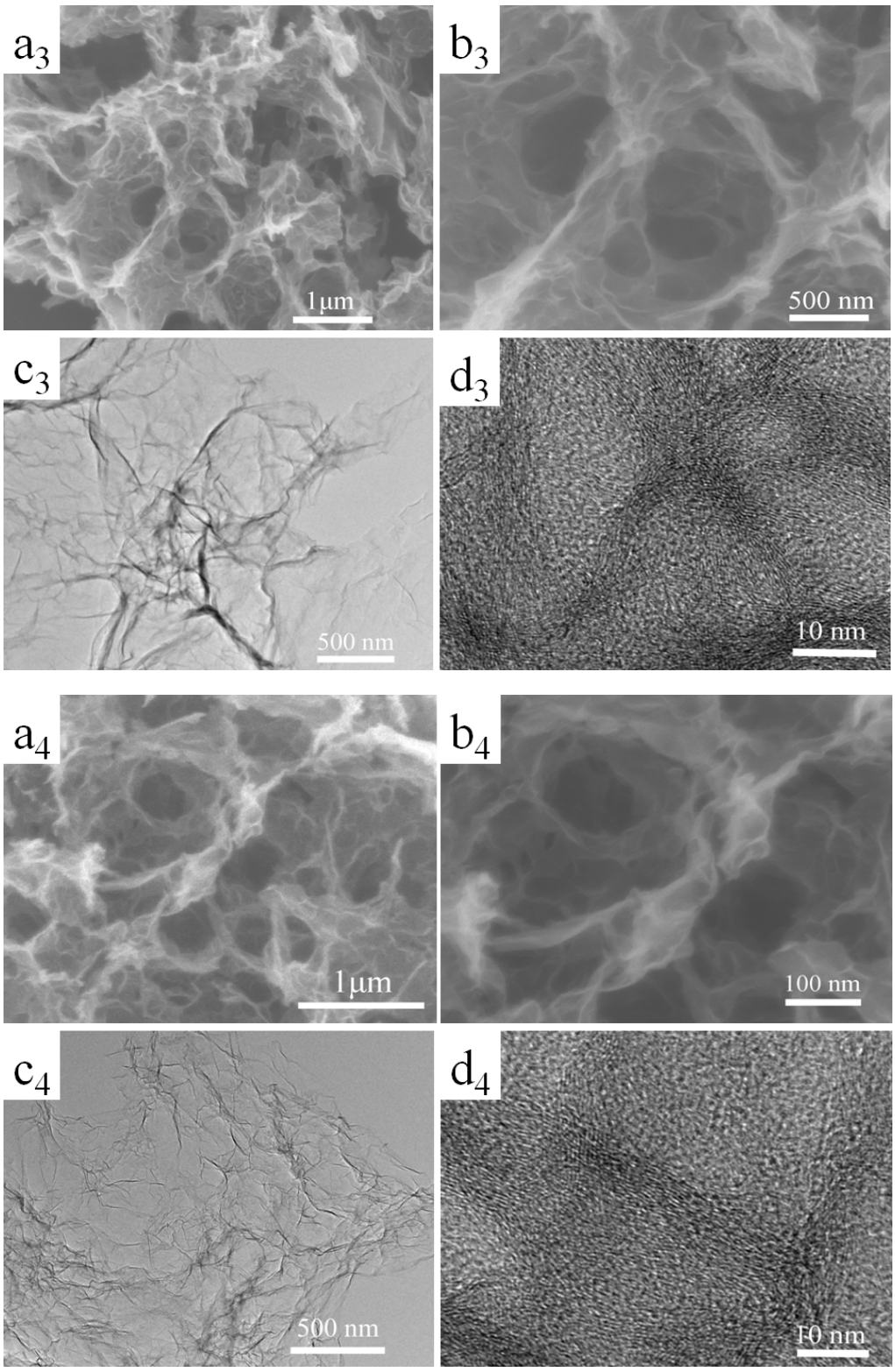


Fig. S1 SEM images of (a_1, b_1) N-GA, (a_2, b_2) B-GA, (a_3, b_3) N, B-GA-800 and (a_4, b_4) N, B-GA-900; TEM and HRTEM images of (c_1, d_1) N-GA, (c_2, d_2) B-GA, (c_3, d_3) N,

B-GA-800 and (c_4, d_4) N, B-GA-900.

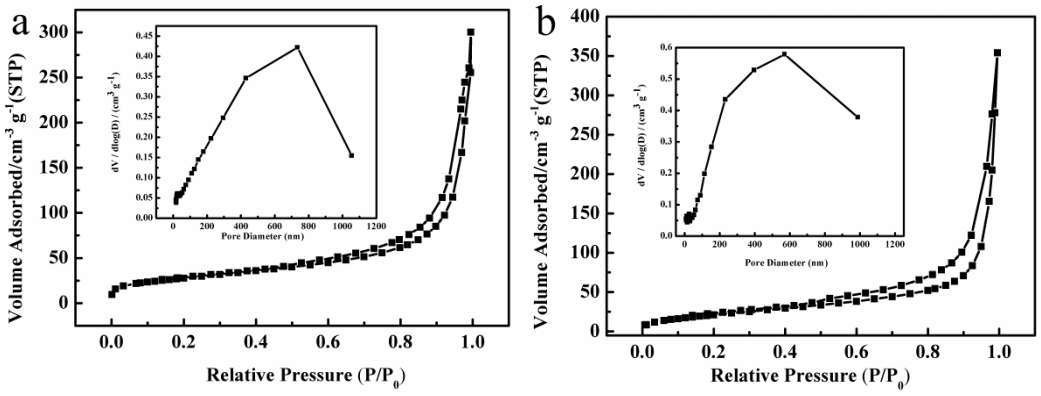


Fig. S2 (a) Nitrogen adsorption-desorption isotherms of (a) B-GA (b) N-GA. The inset is the pore size distribution gained by the Barrett-Joyner-Halenda method.

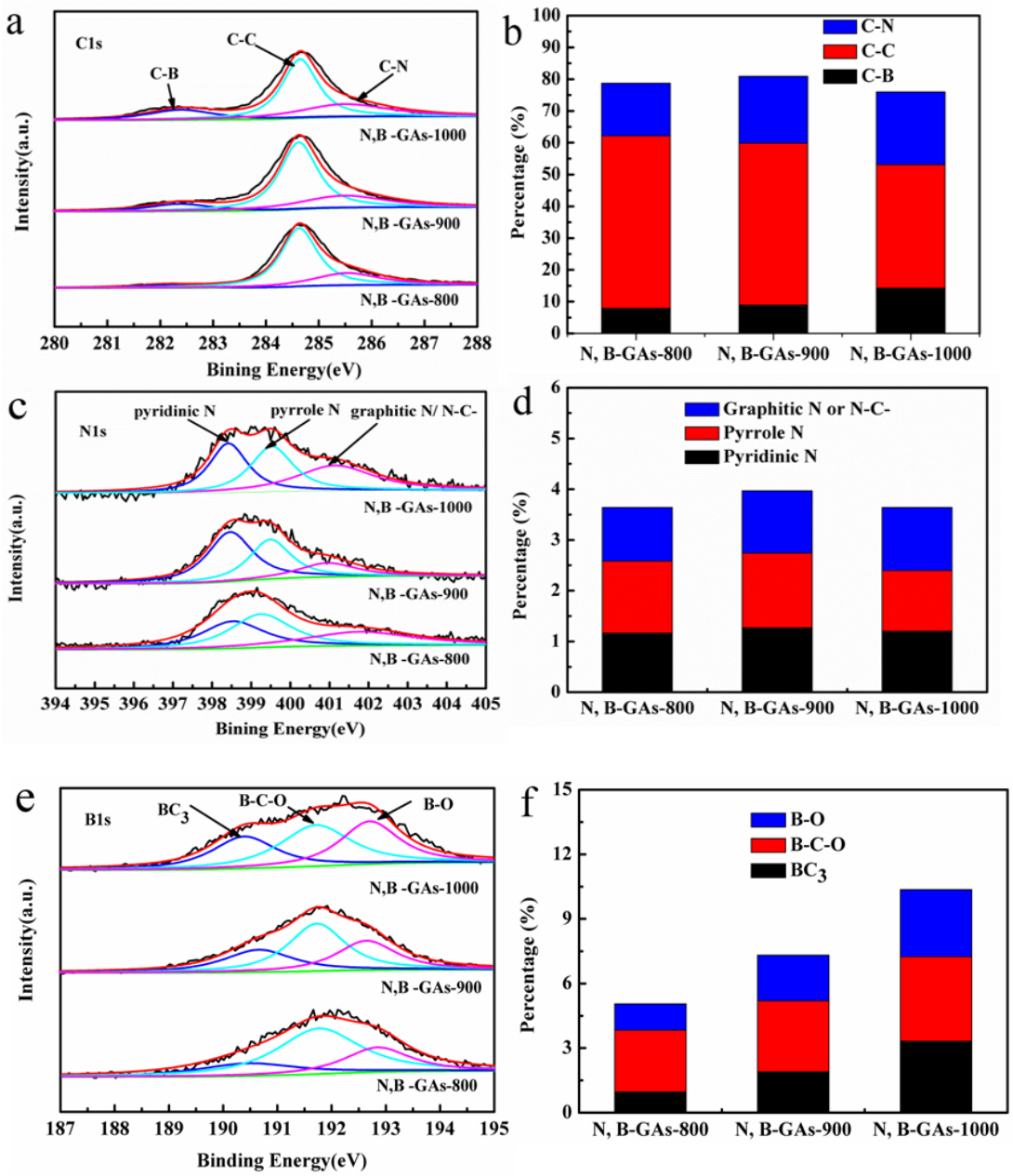


Fig. S3 (a, c, e) High-resolution C1s, N1s, and B1s XPS spectra of N, B-GA at different pyrolysis temperatures; (b) The atomic percentage of three carbon species in N, B-GA pyrolysed at different pyrolysis temperature; (d) The atomic percentage of three nitrogen species in N, B-GA pyrolysed at different pyrolysis temperature; (d) The atomic percentage of three boron species in N, B-GA pyrolysed at different

pyrolysis temperature.

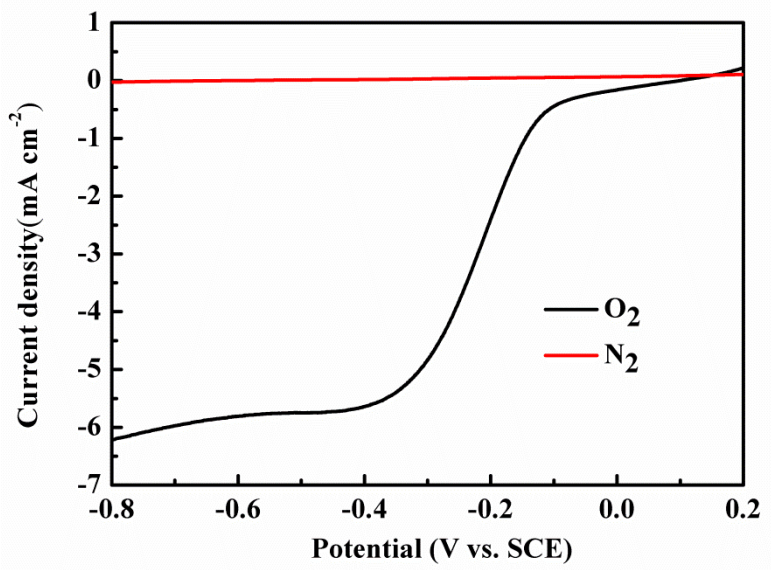
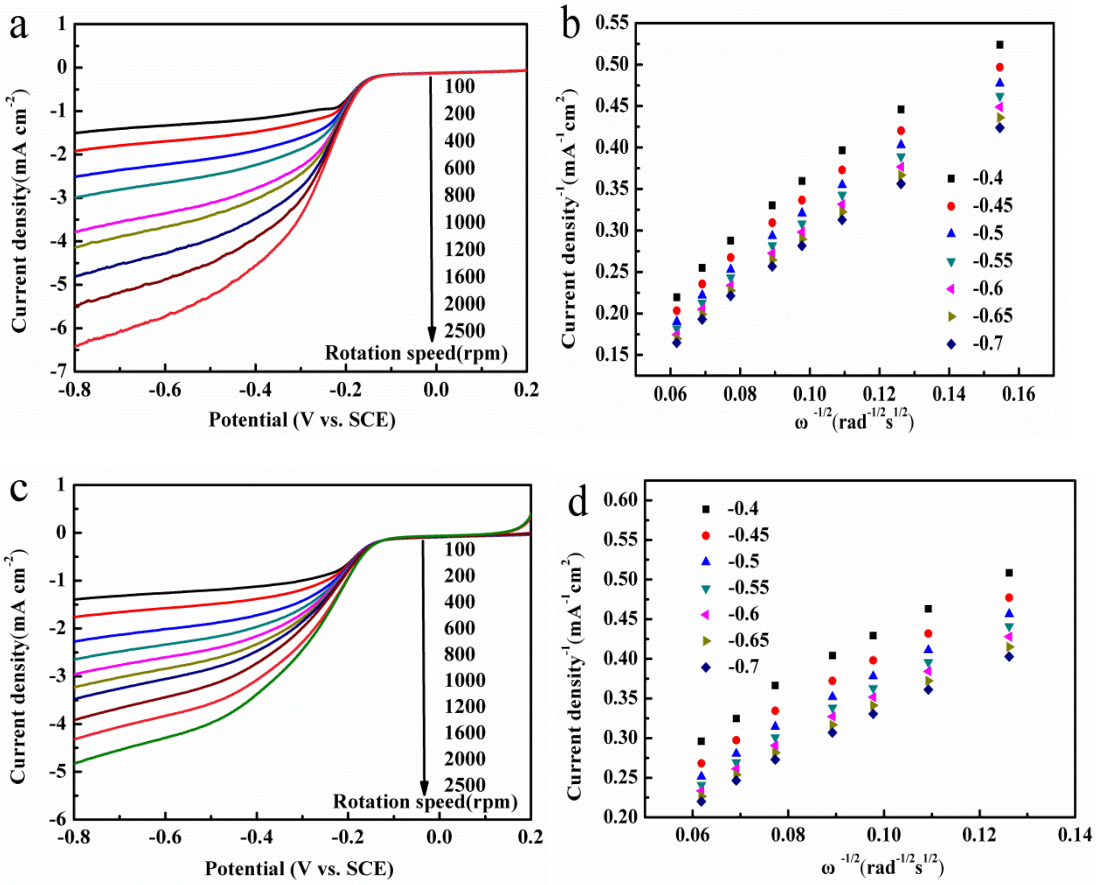


Fig. S4 LSV curves of N, B-GA-1000 in an O_2 or N_2-saturated 0.1 M KOH solution at the rotation speed of 1600 rpm with the scan rate of 10 mV s^{-1}.



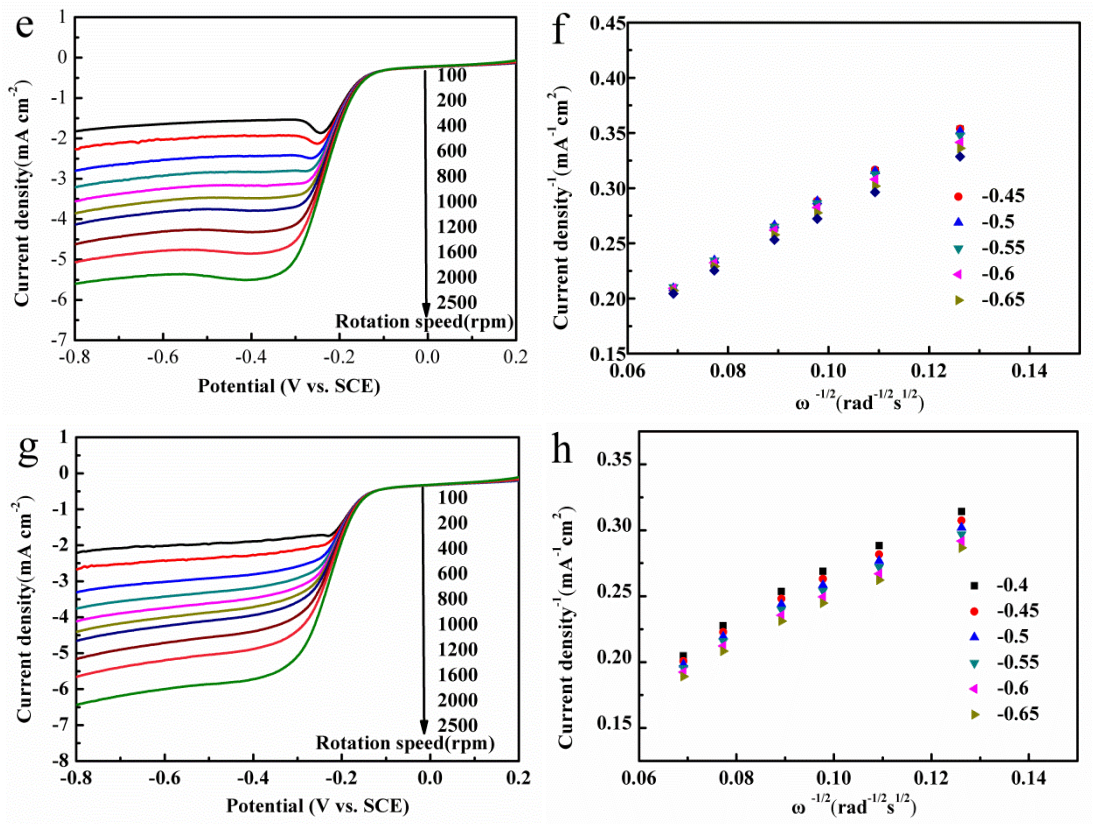
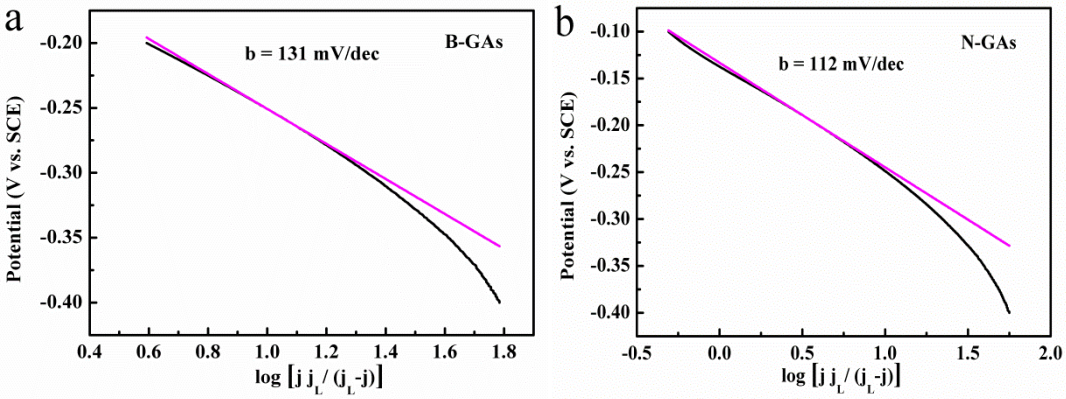


Fig. S5 LSV curves of (a) N-GA (c) B-GA (e) N, B-GA-800 and (g) N, B-GA-900 at different rotation speeds in O_2-saturated 0.1 M KOH with the scan rate of 10 mV s^{-1}; K-L plots of (b) N-GA, (d) B-GA, (f) N, B-GA-800 and (h) N, B-GA-900 at fixed potentials of -0.4, -0.45, -0.5, -0.55, -0.6, -0.65, -0.7V.



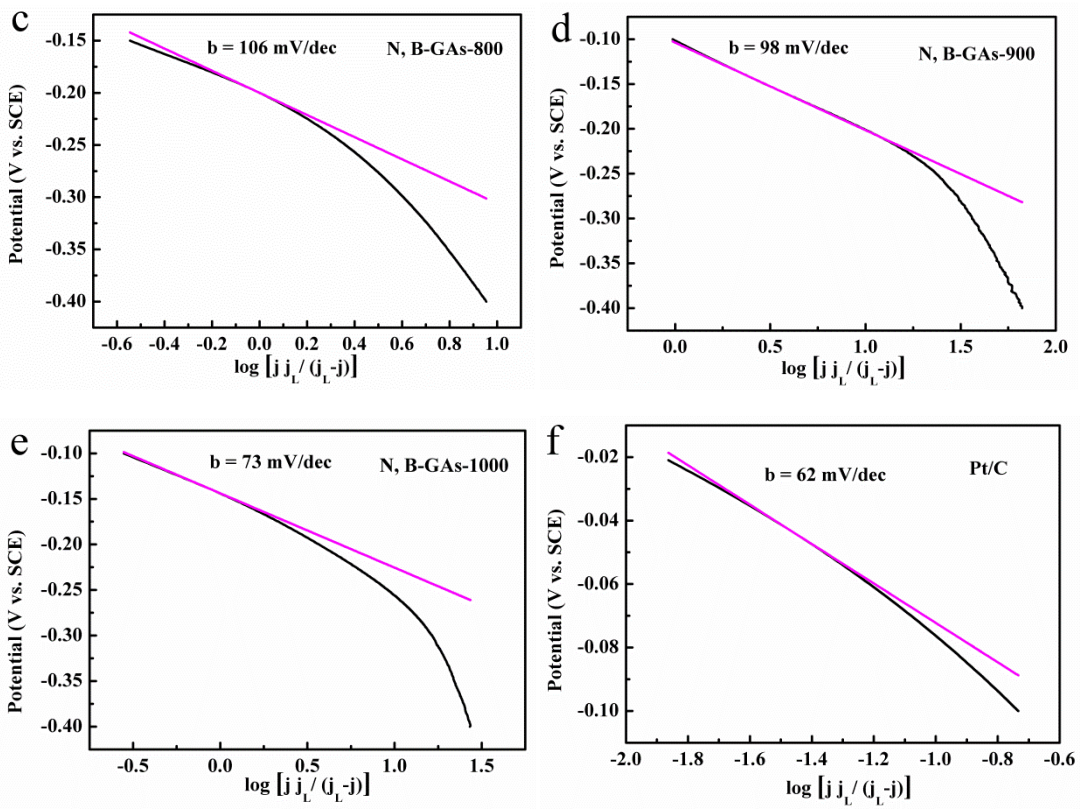


Fig. S6 Tafel plots obtained from RDE measurements on (a) B-GA, (b) N-GA, (c) N, B-GA-800, (d) N, B-GA-900, (e) N, B-GA-1000 and (f) Pt/C at 1600 rpm.

Table S1 Electrochemical parameters for the ORR estimated from LSVs

materials	Onset potential (V *vs*. SCE)	j_L (mA cm^{-2}) at -0.8 V *vs*. SCE	Half ware potential (V *vs*. SCE)	Tafel plot slopes (mV dec^{-1})
B-GA	-0.14	3.94	-0.31	131
N-GA	-0.14	4.82	-0.27	112
N, B-GA-800	-0.12	4.62	-0.22	106
N, B-GA-900	-0.11	5.15	-0.23	98
N, B-GA-1000	-0.07	6.20	-0.21	73
Pt/C	-0.02	5.21	-0.17	62