Electronic Supplementary Information

Covalent functionalization based heteroatom doped graphene nanosheet as a metal-free electrocatalyst for oxygen reduction reaction

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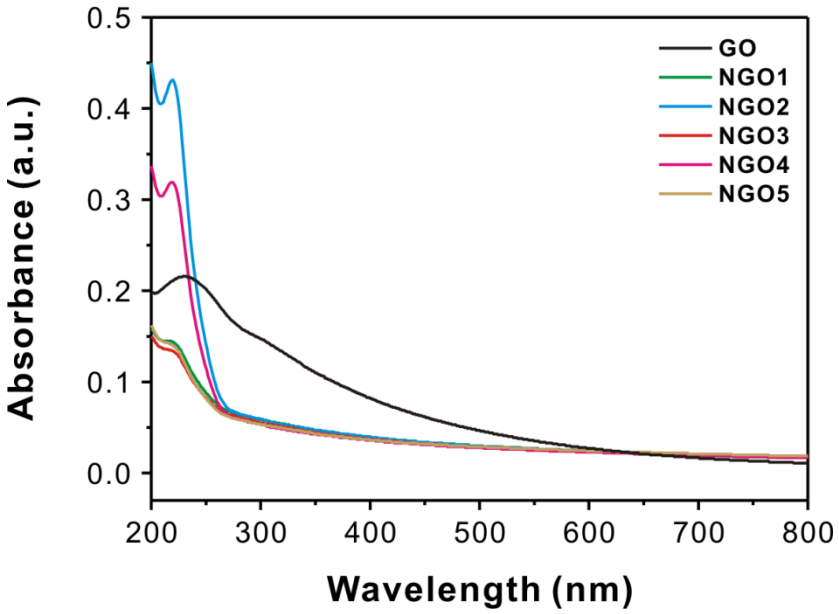

Fig. S1 UV-vis absorbance spectra for GO suspension and NGO*n* derivatives. Concentration of suspensions is 0.5 μg mL^{-1}.

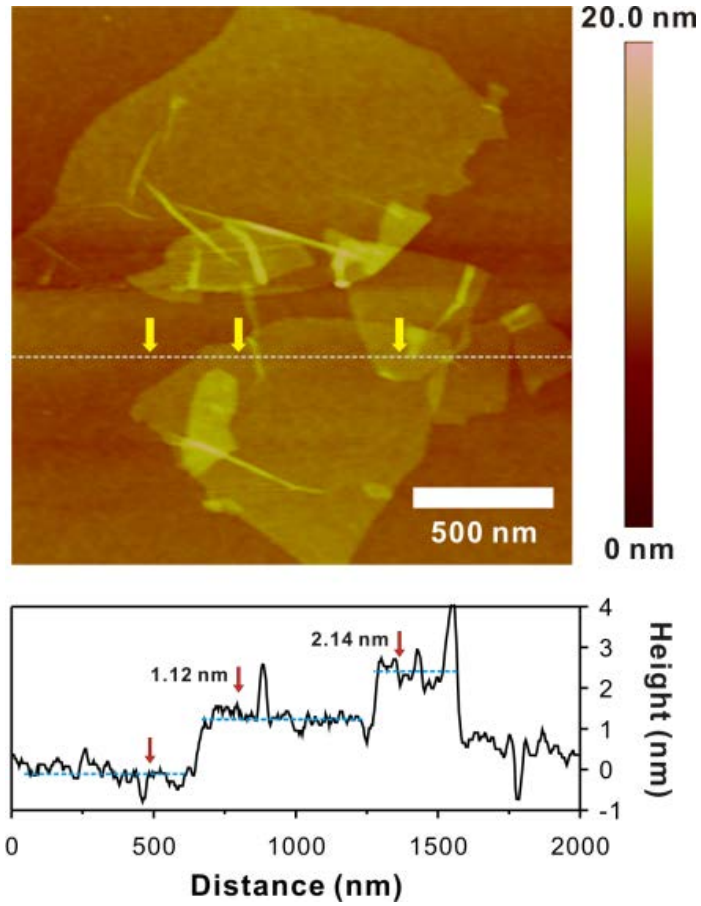

Fig. S2 Representative height-mode AFM images of NGO3 with the corresponding line scan profiles. The height of monolayer and bilayer is about 1.12 nm and 2.14 nm, respectively.

Table. S1 Relative ratio of nitrogen configurations in NRGO*n* by deconvoluted high-resolution XPS N1s spectra. Number in parenthesis represents the binding energy in eV.

	Pyridinic-N	Pyrrolic-N	Graphitic-N	Oxide-N
NRGO1	39.99 (398.21)	34.42 (399.87)	20.42 (401.39)	5.17 (403.04)
NRGO2	29.87 (398.00)	19.72 (399.35)	35.55 (401.12)	14.86 (403.11)
NRGO3	43.22 (398.07)	22.70 (399.87)	26.65 (401.20)	7.44 (403.21)
NRGO4	31.98 (398.15)	36.90 (399.62)	23.21 (401.03)	7.90 (403.12)
NRGO5	38.91 (398.24)	27.12 (400.07)	27.06 (401.00)	6.91 (403.05)

Table. S2 Relative ratio of atomic compositions by XPS measurement**.**

	C	**O**	**N**
TRGO	84.99	15.01	ND
NRGO1	84.17	15.11	0.72
NRGO2	90.48	8.32	1.19
NRGO3	93.77	3.17	3.06
NRGO4	91.75	4.98	3.28
NRGO5	89.47	6.22	4.3

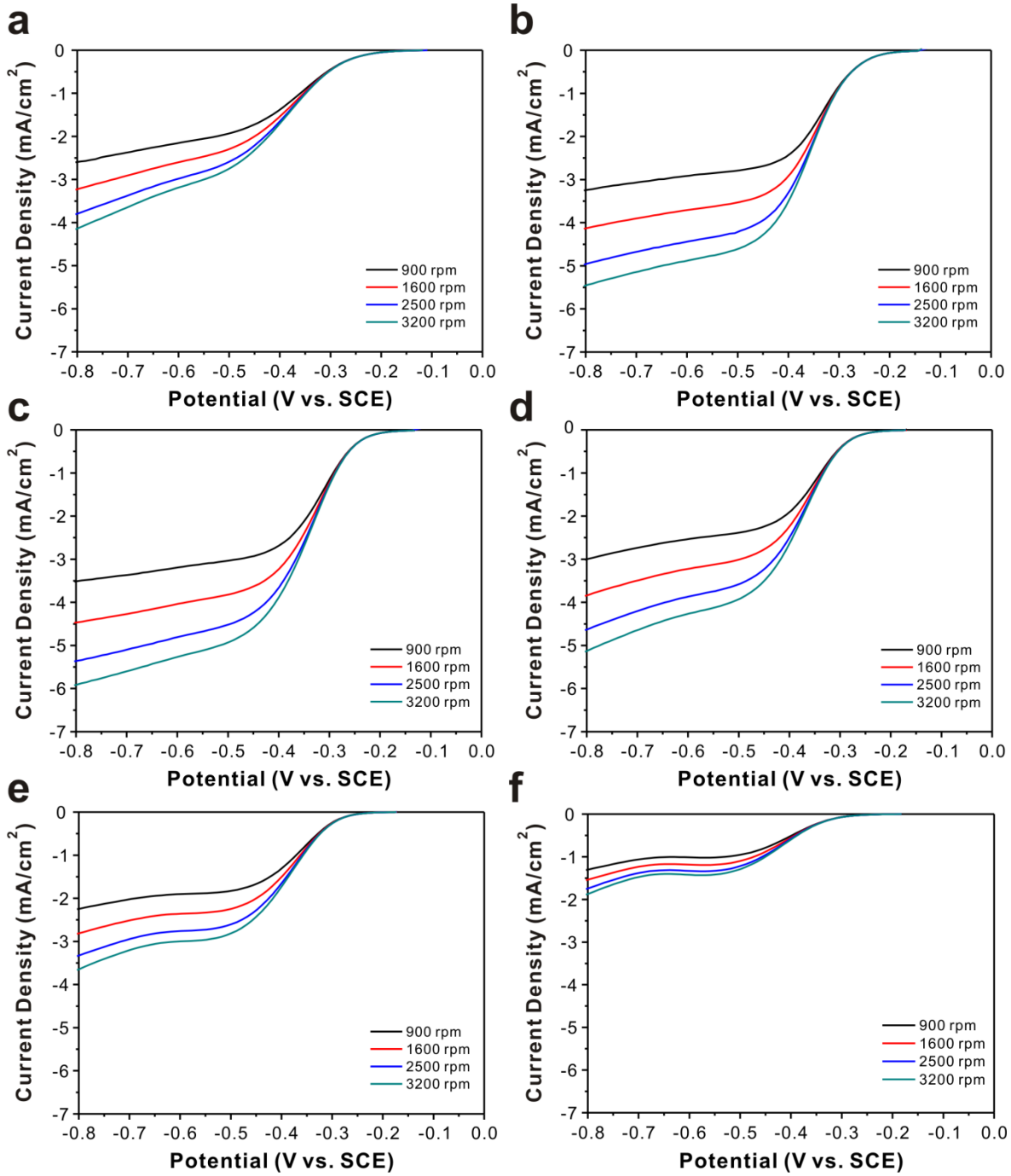

Fig. S3 RDE measurements at 10 mV s^{-1} scan rate in O_2-saturated 0.5 M KOH electrolyte. (a) Linear Sweep Voltammograms for (a) NRGO1, (b) NRGO2, (c) NRGO3, (d) NRGO4, (e) NRGO5, and (f) TRGO at 2500 rpm.

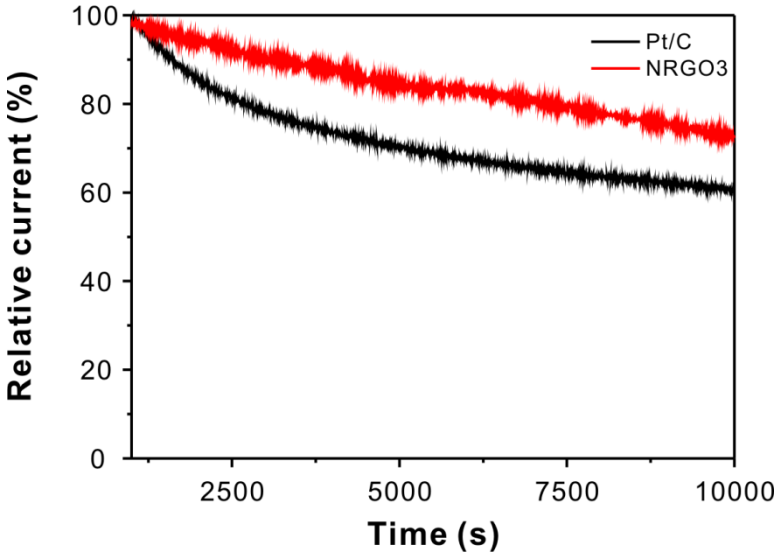

Fig. S4 The chronoamperometric durability response for 10000 s with Pt/C and NRGO3. NRGO3 exhibited a slow attenuation with high current retention of 73%, which is higher than that of Pt/C in the O_2-saturated 0.1 M KOH solution at -0.25 V (*vs.* SCE) with 1600 rpm.