Electronic Supplementary Material

Fabricating of functionalized 3D graphene with controllable micro/meso-pores as a superior electrocatalyst for enhanced oxygen reduction in both acidic and alkaline solutions

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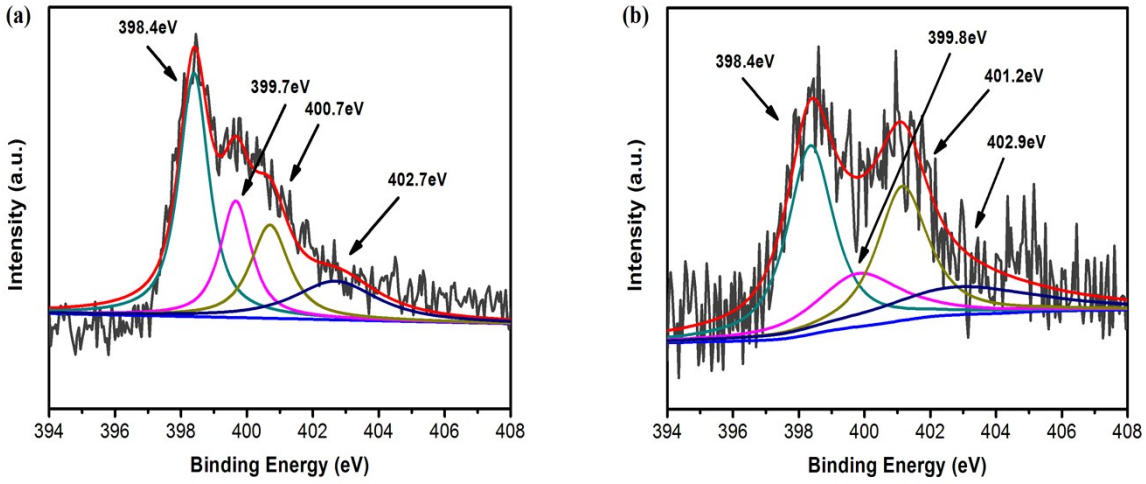

Fig. S1 (a) High-resolution N 1s spectrum of the 3D Fe_5C_2/N-PG-1.0-700. (b) High-resolution N 1s spectrum of the 3D Fe_5C_2/N-PG-1.0-900.

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Table S1 Surface element contents obtained from the XPS analysis.

samples	C 1s %	N 1s %	O 1s %	Fe 2p %	N at%			
					Pyridinic N	Pyrrolic N	Graphitic N	Oxidized N
3D Fe_5C_2/N-PG-1.0-700	90.75	5.39	3.57	0.29	2.21	1.11	1.09	0.97
3D Fe_5C_2/N-PG-1.0-800	94.16	2.82	2.78	0.24	0.96	0.66	0.78	0.42
3D Fe_5C_2/N-PG-1.0-900	95.42	1.72	2.73	0.13	0.61	0.32	0.48	0.31

Table S2 Electrochemical performance of different electrocatalysts for ORR.

Materials	E_{onest} (V)	$E_{1/2}$ (V)	J_L (mA cm^{-2})	Electrolyte solution	Reference electrode	Rreference
3D Fe_5C_2/N-PG-1.0-800	0.88	0.71	6.62	0.5 M H_2SO_4	RHE	In this work
Fe−N−CC	0.80	0.52	3.50	0.5 M H_2SO_4	RHE	1
PANI−Fe	0.85	--	4.50	0.5 M H_2SO_4	RHE	2
Co−N−GA	0.88	0.73	5.90	0.5 M H_2SO_4	RHE	3
ZIF−67−900	0.85	0.71	3.90	0.5 M H_2SO_4	RHE	4
Fe−N−HCMS	0.80	--	6.30	0.5 M H_2SO_4	RHE	5

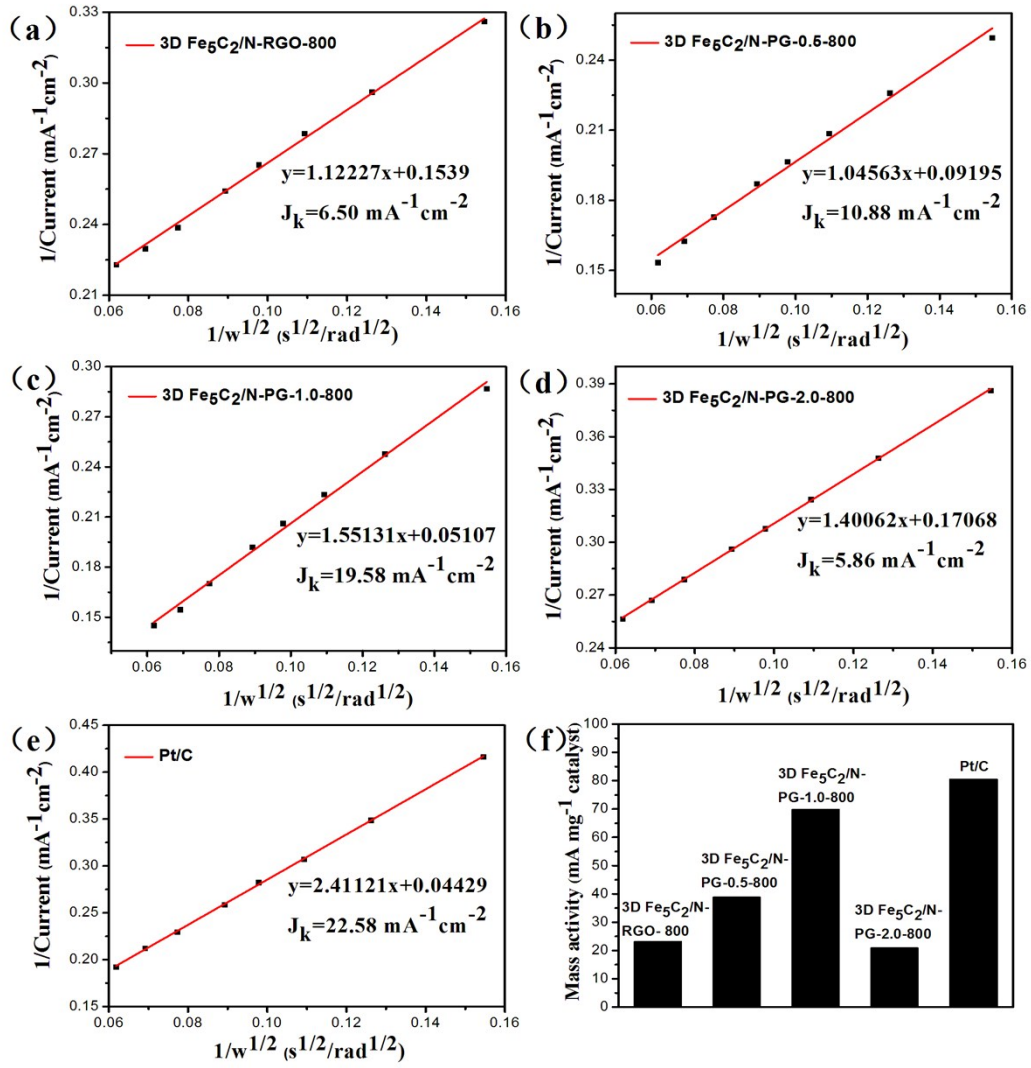

Fig. S2 The K-L plots and the corresponding kinetic current density of 3D Fe_5C_2/N-RGO-800 (a), 3D Fe_5C_2/N-PG-0.5-800 (b), 3D Fe_5C_2/N-PG-1.0-800 (c), 3D Fe_5C_2/N-PG-2.0-800 (d) and Pt/C (e) sample at 0.6 V vs. RHE in O_2-saturated 0.5 M H_2SO_4 solution at 1600 rpm, respectively. (f) Mass activity of 3D Fe_5C_2/N-RGO-800, 3D Fe_5C_2/N-PG-h-800 and Pt/C samples at 0.6 V vs. RHE in O_2-saturated 0.5 M H_2SO_4 solution at 1600 rpm. The catalyst loading in all cases is 280 μg cm^{-2}.

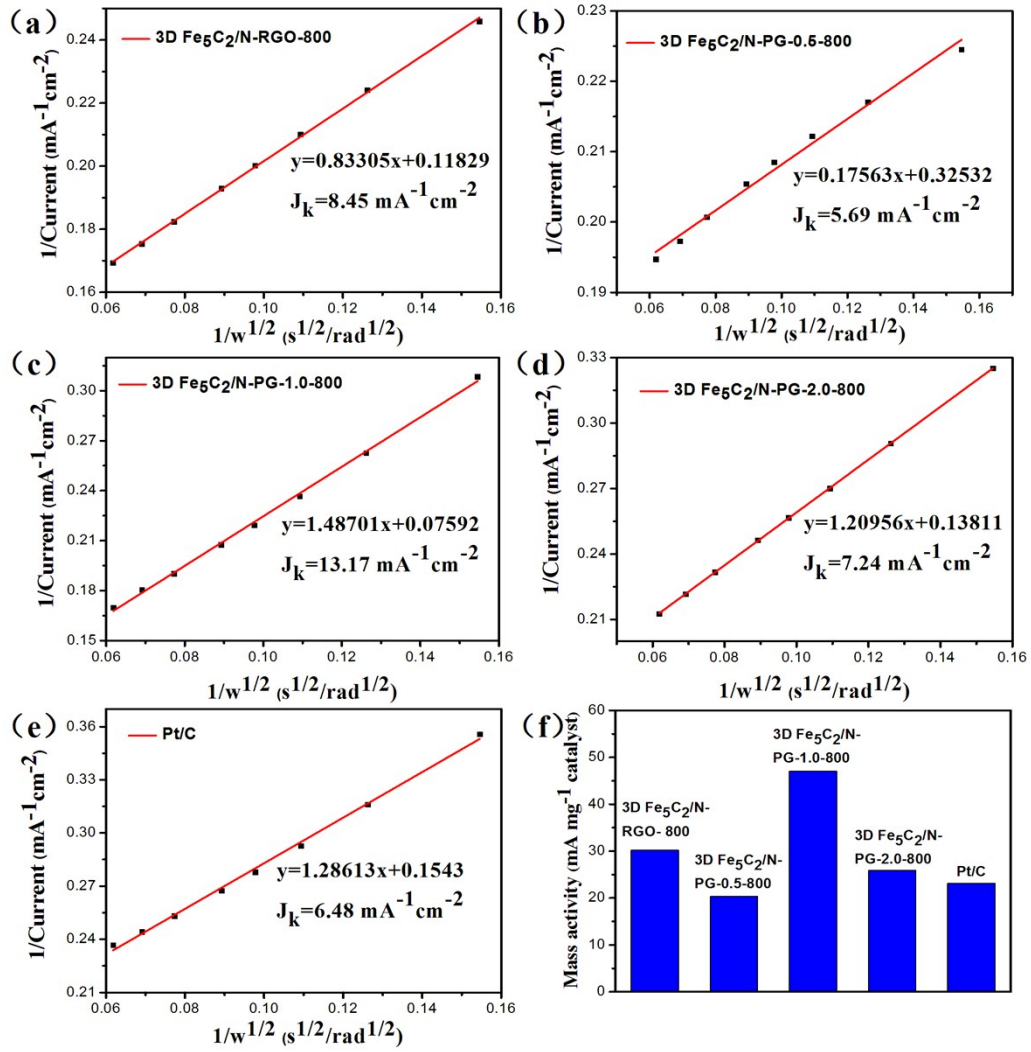

Fig. S3 The K-L plots and the corresponding kinetic current density of 3D Fe_5C_2/N-RGO-800 (a), 3D Fe_5C_2/N-PG-0.5-800 (b), 3D Fe_5C_2/N-PG-1.0-800 (c), 3D Fe_5C_2/N-PG-2.0-800 (d) and Pt/C (e) at 0.8 V vs. RHE in O_2-saturated 0.1 M KOH solution at 1600 rpm, respectively. (f) Mass activity of 3D Fe_5C_2/N-RGO-800, 3D Fe_5C_2/N-PG-h-800 and Pt/C samples at 0.8 V vs. RHE in O_2-saturated 0.1 M KOH solution at 1600 rpm. The catalyst loading in all cases is 280 μg cm^{-2}.

References

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