Supporting Information

Facile synthesis of N-rich carbon quantum dots by spontaneous polymerization and incision of solvents as efficient bioimaging probes and advanced electrocatalysts for oxygen reduction reaction

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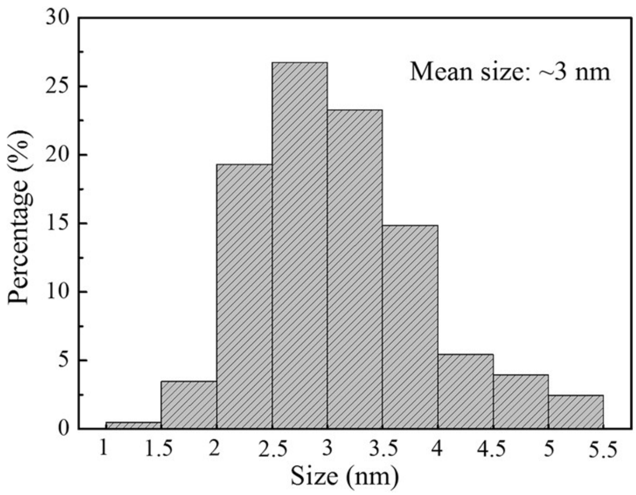

Fig. S1 The size distribution of the N-CDs in 24 h, corresponding to the typical TEM image of the N-CDs in Fig. 1.

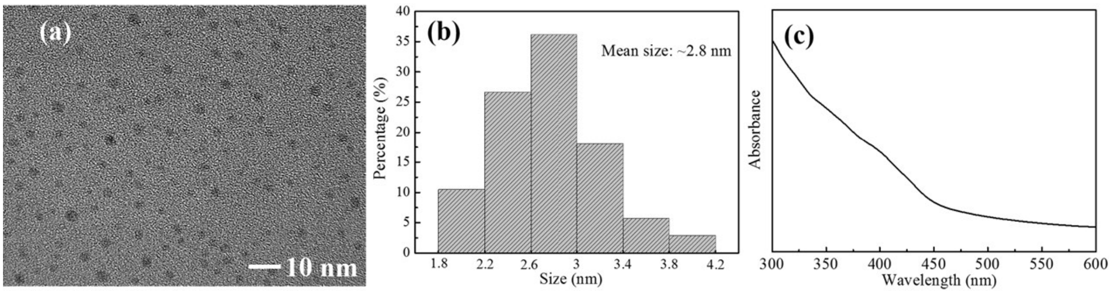

Fig. S2 (a) a typical TEM image of the N-CDs prepared in 48 h, (b) the size distribution of the N-CDs, (c) UV-vis spectrum of the N-CDs prepared in 48 h.

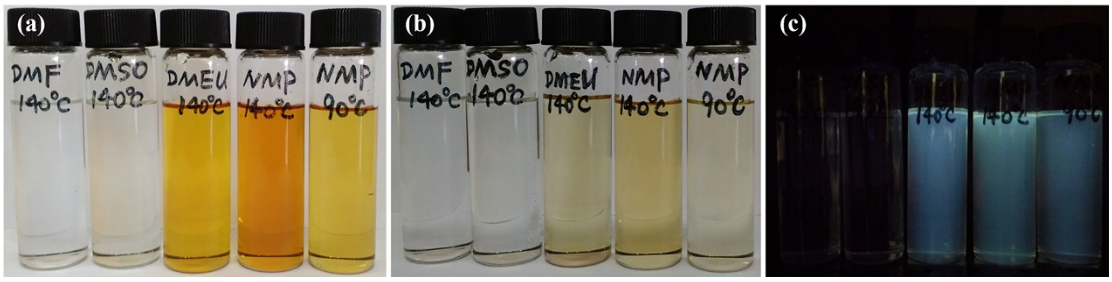

Fig. S3 (a) Typical digital photograpghs of DMF, DMSO, DMEU, NMP after the solverthermal treatment in natural light; (b) the diluted products in natural light and (c) under 365 nm UV radiation.

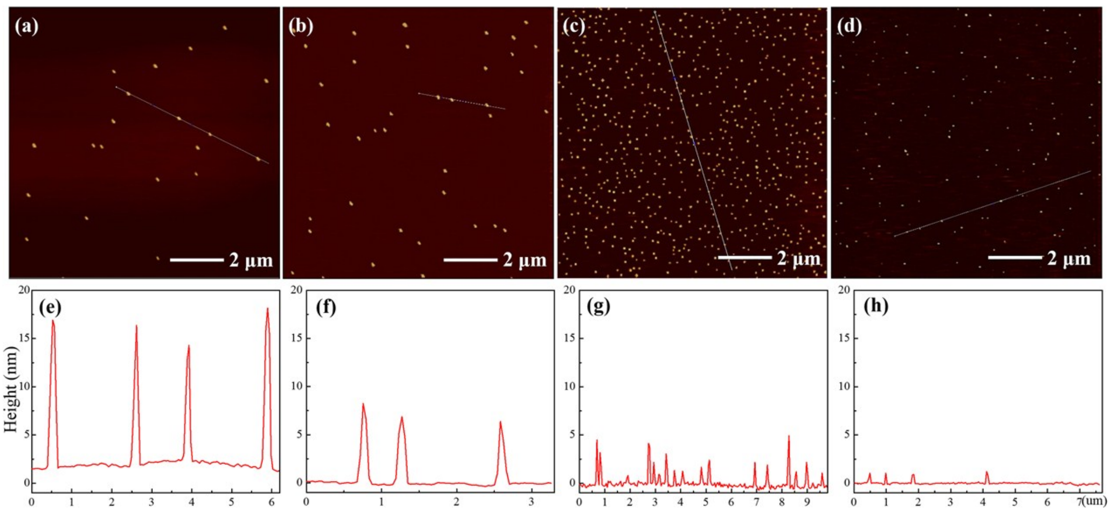

Fig. S4 Time-resolved AFM images of N-CDs. (a,e) corresponds to the products at 0.5 h, (b,f) corresponds to the products at 1.5 h, (c,g) corresponds to the products at 6 h and (d,h) corresponds to the products at 24 h.

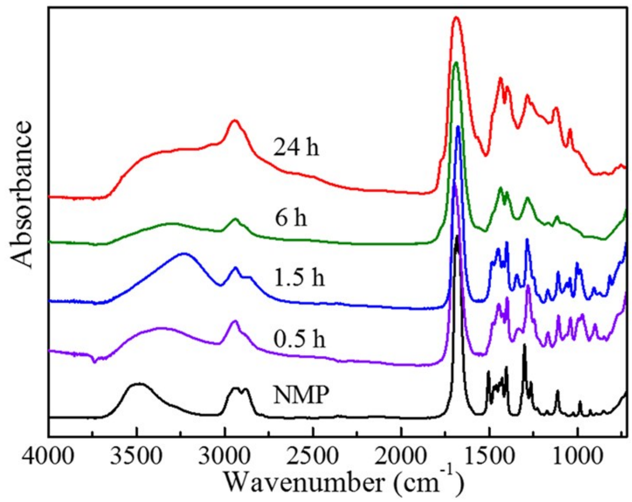

Fig. S5 Time-resolved FTIR spectra of N-CDs.

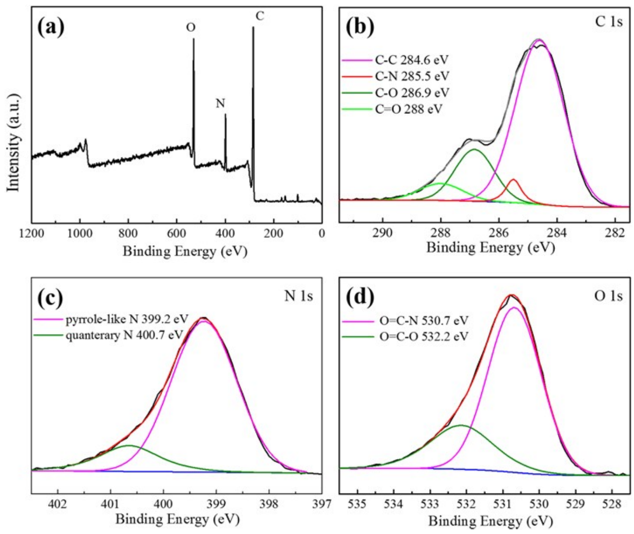

Fig. S6 XPS spectra of the N-CDs: (a) survey spectrum; (b) high-resolution C1s; (c) high-resolution N1s; (d) high-resolution O1s.

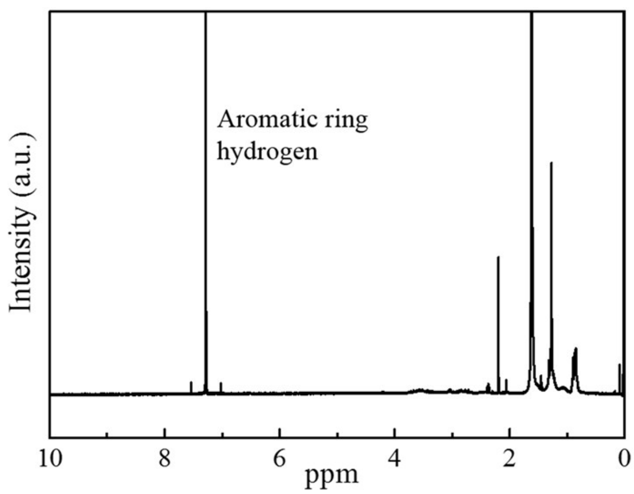

Fig. S7 NMR spectrum of the N-CDs.

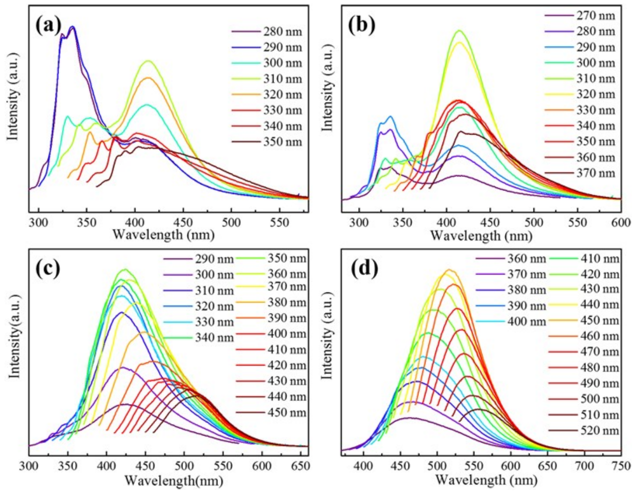

Fig. S8 Time-resolved PL spectra of the N-CDs. (a) corresponds to the products at 0.5 h, (b) corresponds to the products at 1.5 h, (c) corresponds to the products at 6 h and (d) corresponds to the products at 24 h.

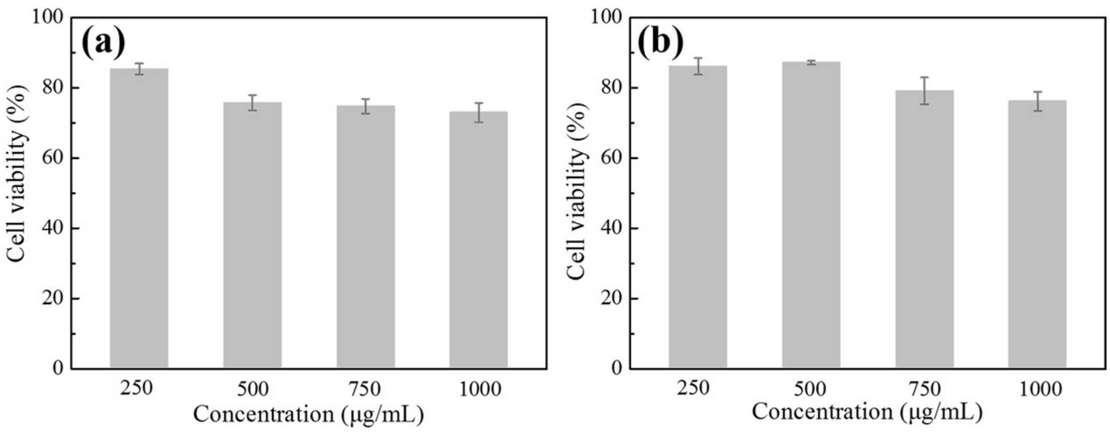

Fig. S9 Cell viability assay with HEK 293T cells treated with different concentrations of the N-CDs after 24 h (a) and 48 h (b).

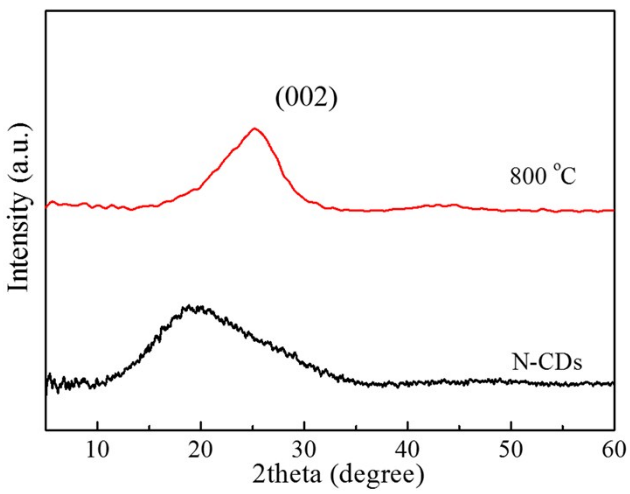

Fig. S10 XRD patterns of the N-CDs and the post-treated sample.

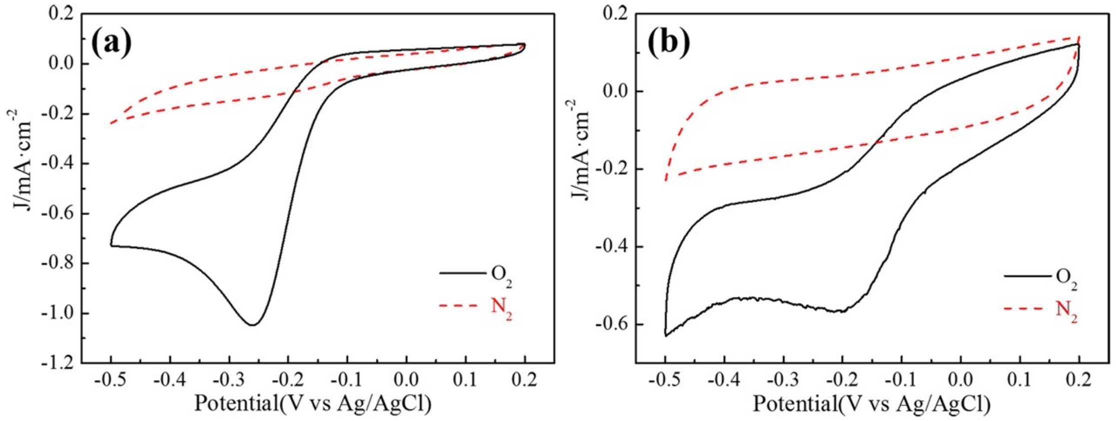

Fig. S11 (a) CV curves of the N-CDs and (b) Pt/C commercial catalysts in O_2- saturated and N_2-saturated 0.1 M KOH.

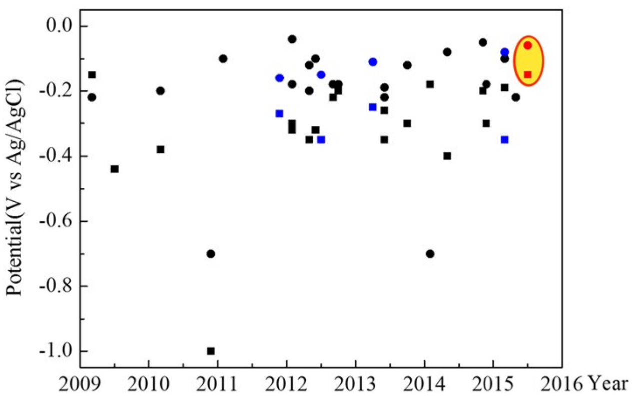

Fig. S12 A summary of ORR performances of the CDs (the blue symbols), other N-doped carbon materials (black symbols) and the cureent work (the red symbols). The squares correspond to the cathodic oxygen reduction peaks, the circular symbols correspond to the onset potentials.

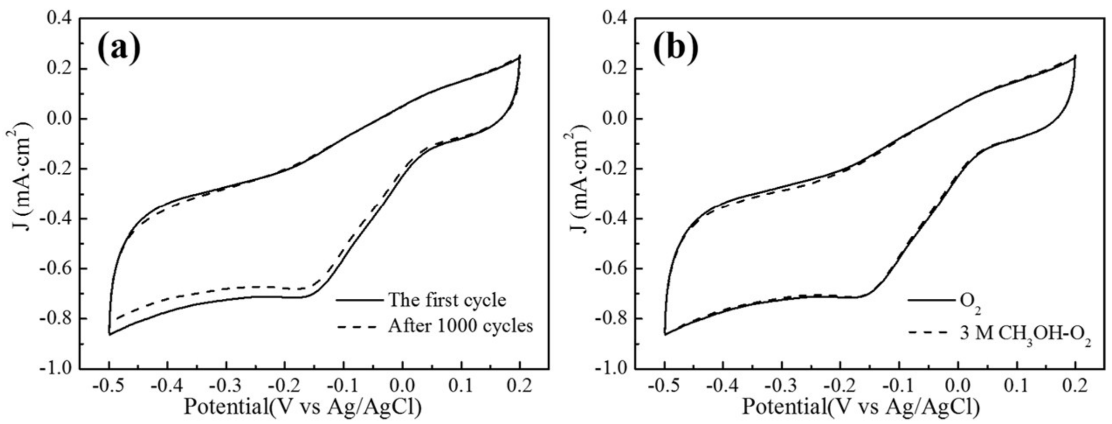

Fig. S13 (a) The electrochemical stability of the N-CDs after thermal treatment at 800 ^oC by continuous cyclic voltammetry in O_2-saturated 0.1 M KOH solution; (b) CV curves of the N-CDs after thermal treatment at 800 ^oC in O_2-saturated 0.1 M KOH solution (solid curves) and O_2-saturated 0.1 M KOH solutions with 3 M CH_3OH (dotted curves).

Table S1 A summary of ORR performances of N-doped carbon materials.

Year	Samples	cathodic oxygen reduction peak	onset potential	References
2009	Nitrogen-doped carbon nanotube arrays	-0.15 V	-0.22 V	1
2009	Nitrogen-doped carbon nanotube cups	-0.44 V	/	2
2010	Nitrogen-doped graphene	-1.0 V	-0.7 V	3
2010	Nitrogen-doped graphene	-0.38 V	-0.2 V	4
2011	Nitrogen-doped graphene sheets	/	-0.1	5
2011	Nitrogen-doped graphene quantum dots	-0.27 V	−0.16 V	6
2012	N-doped graphene	-0.32 V	−0.04 V	7
2012	Nitrogen-doped graphene	/	-0.12 V	8
2012	Nanoporous nitrogen doped carbon modified graphene	-0.35 V	-0.2 V	9
2012	Nitrogen-doped graphene	-0.32 V	-0.1 V	10
2012	Fluorescent carbon nanodots	-0.35 V	-0.15 V	11
2012	Nitrogen-doped carbon nanocages	-0.22 V	-0.18 V	12
2012	3D nitrogen-doped graphene	-0.2 V	-0.18 V	13
2012	Nitrogen-doped graphene framework	-0.3 V	-0.18 V	14
2013	Graphene quantum dot hybrids	-0.25 V	-0.11 V	15
2013	Polyaniline-derived N- and O−doped mesoporous carbons	-0.26 V	-0.22 V	16
2013	N-doped graphene foam	-0.35 V	-0.19 V	17
2013	N-doped graphene	-0.3 V	-0.12 V	18
2014	Bicontinuous nanoporous N-doped graphene	-0.4 V	-0.08 V	19
2014	Okara-derived N-doped mesoporous carbon	-0.18 V	-0.7 V	20
2014	Self-supported bimodal-pore structured nitrogen-doped carbon fiber aerogel	-0.2 V	-0.05 V	21
2014	N-doped hierarchically macro/mesoporous carbon	-0.3 V	-0.18 V	22
2015	Nitrogen-doped graphene/CNT composite	-0.19 V	-0.1 V	23
2015	Nitrogen-doped carbon nanodots @ nanospheres	-0.35 V	-0.08 V	24
2015	N-doped carbon nanocages	/	-0.22 V	25

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