Supporting Information for

Nitrogen-doped carbon-based dots prepared by dehydrating EDTA with hot sulfuric acid and its electrocatalysis for oxygen reduction reaction

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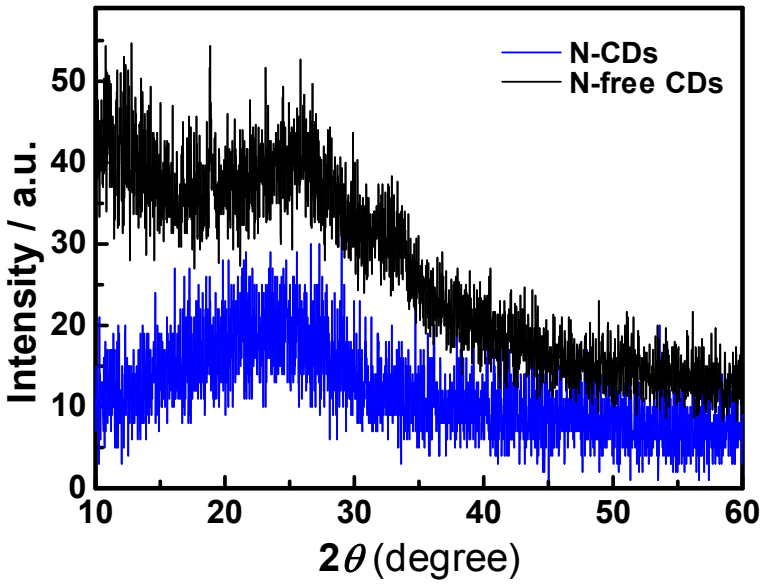

Fig. S1 XRD pattern of the as-prepared N-CDs and N-free CDs.

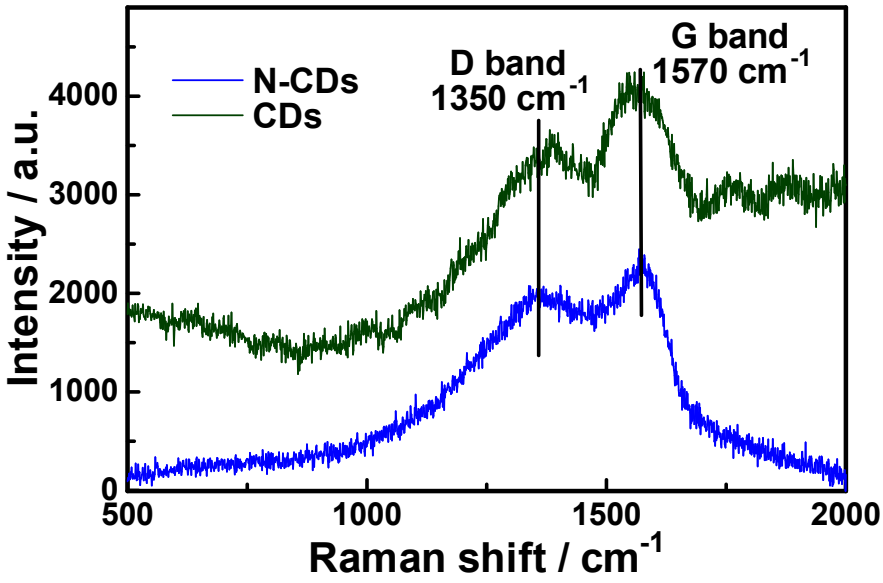

Fig. S2 Raman spectra of the obtained N-CDs and N-free CDs.

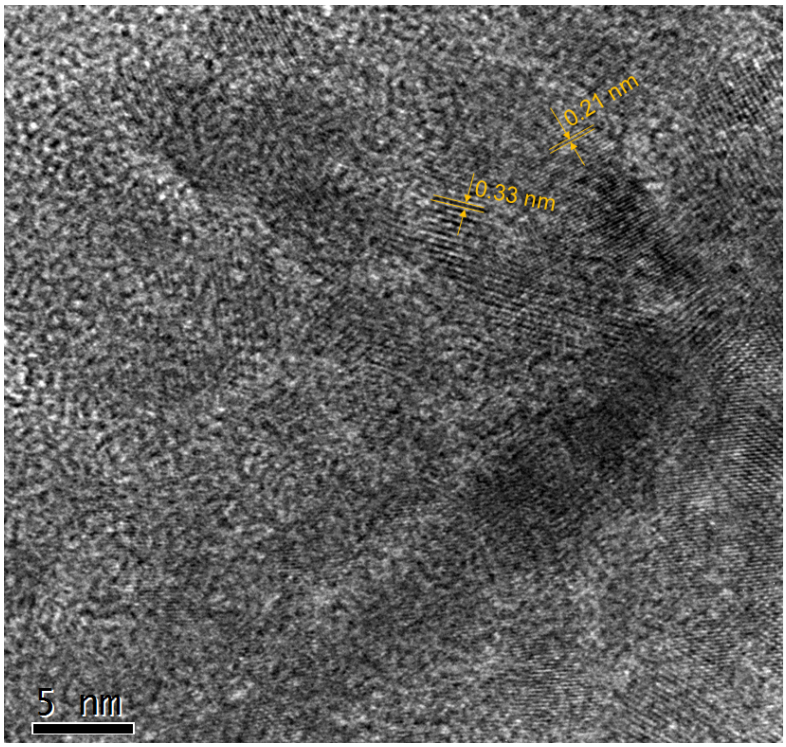

Fig. S3 HRTEM of the N-free CDs.

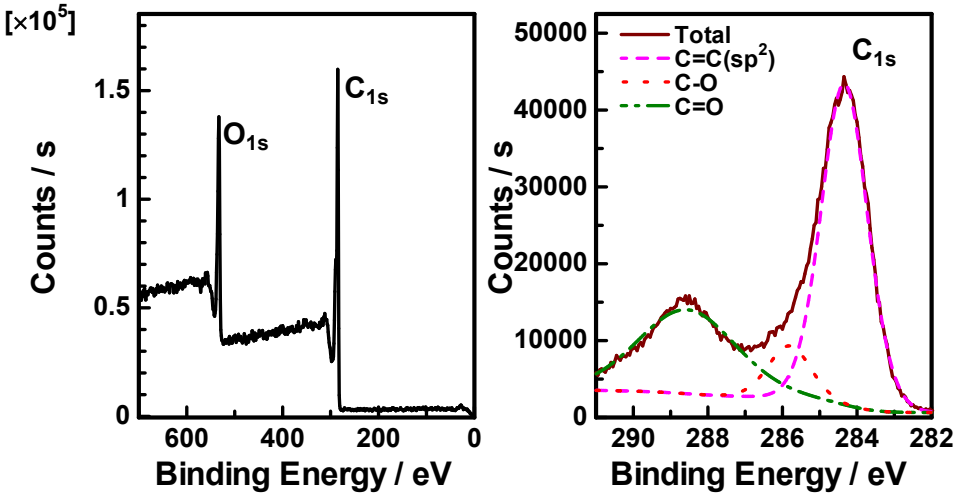

Fig. S4 XPS spectrum (left) and high-resolution C1s spectrum (right) of the N-free CDs.

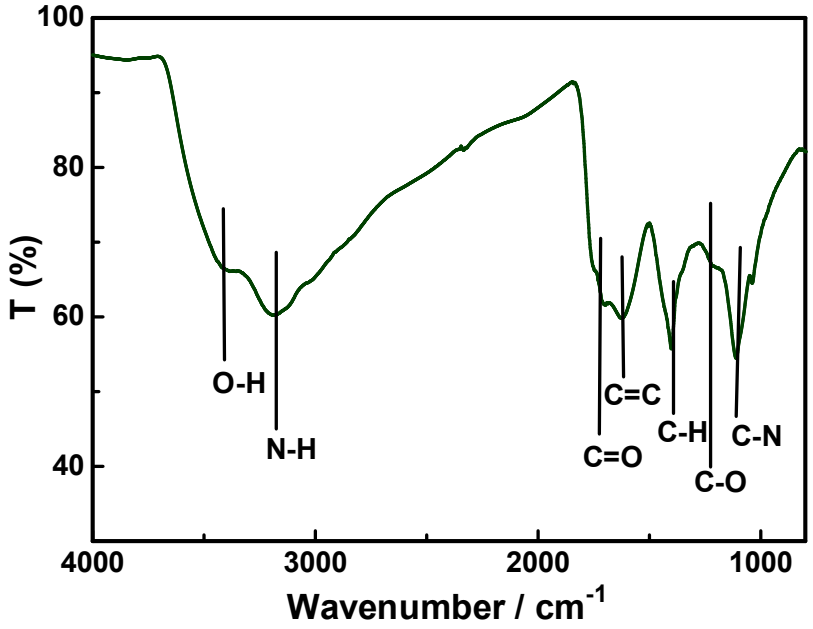

Fig. S5 FTIR spectra of the obtained N-CDs.

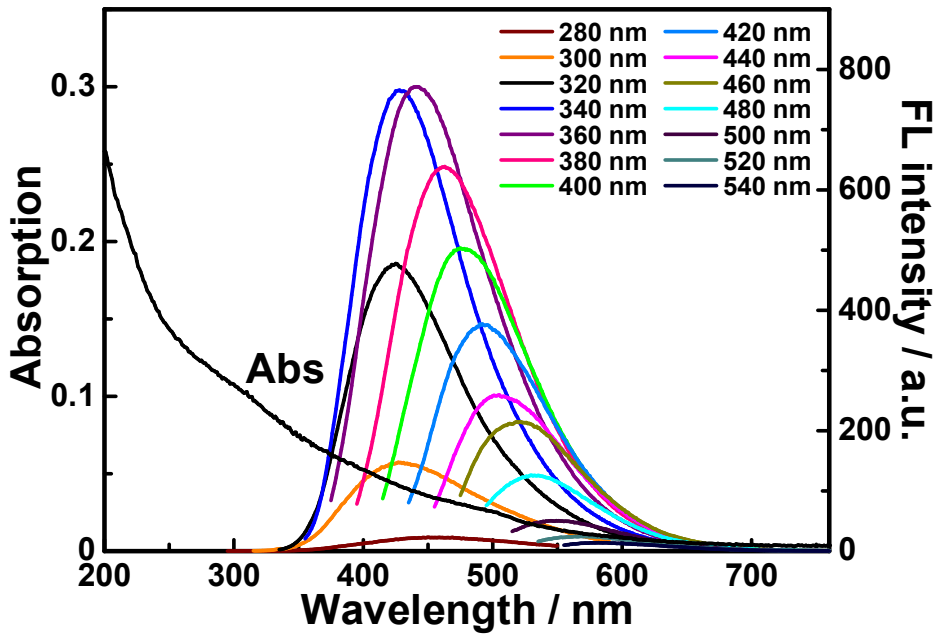

Fig. S6 UV-Vis absorption and PL spectra (recorded for progressively longer excitation wavelengths in 20 nm increments) of the obtained N-free CDs.

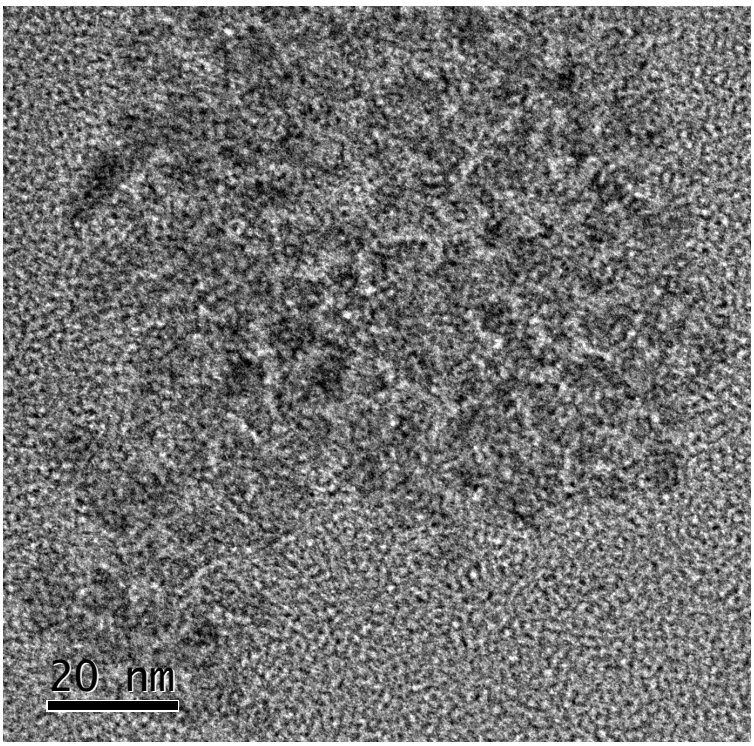

Fig. S7 TEM image of the 3-month aged N-CDs.

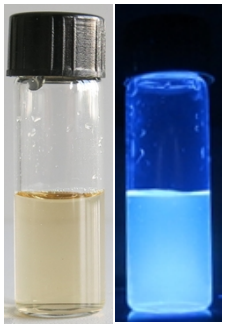

Fig. S8 Photograph of 3-month N-CDs under illumination of white light (left) and UV (365 nm) light (right)

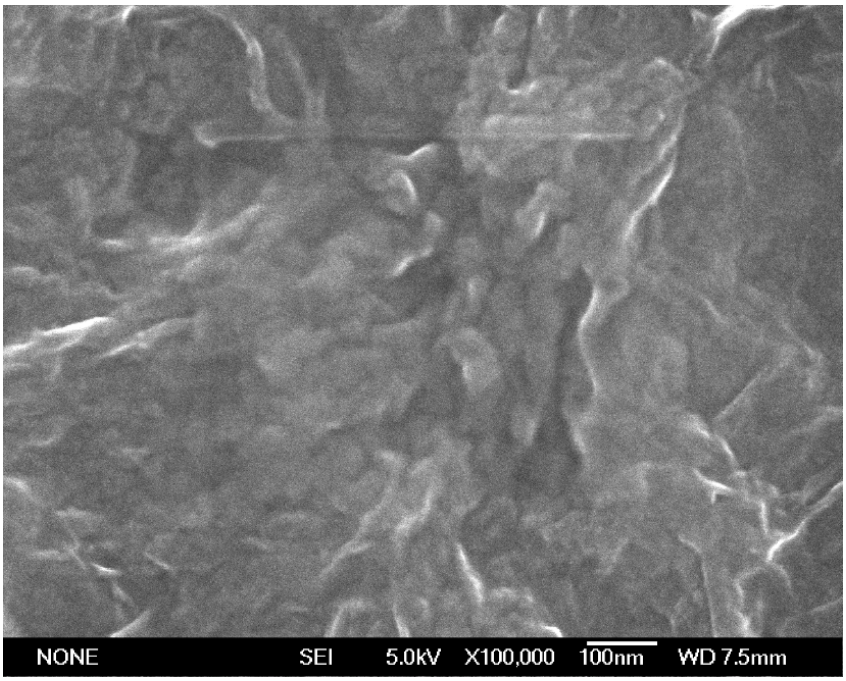

Fig. S9 SEM image of N-CD/graphene.

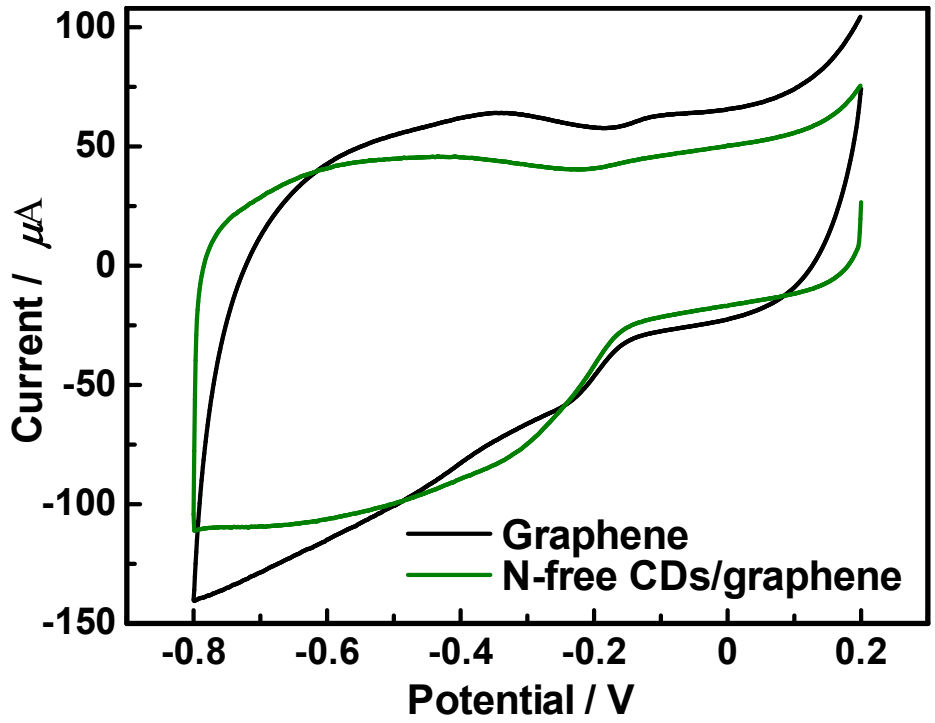

Fig. S10 Cyclic voltammograms of hydrothermally treated graphene and N-free CDs/graphene on GC electrode in O_2-saturated 1 M KOH.

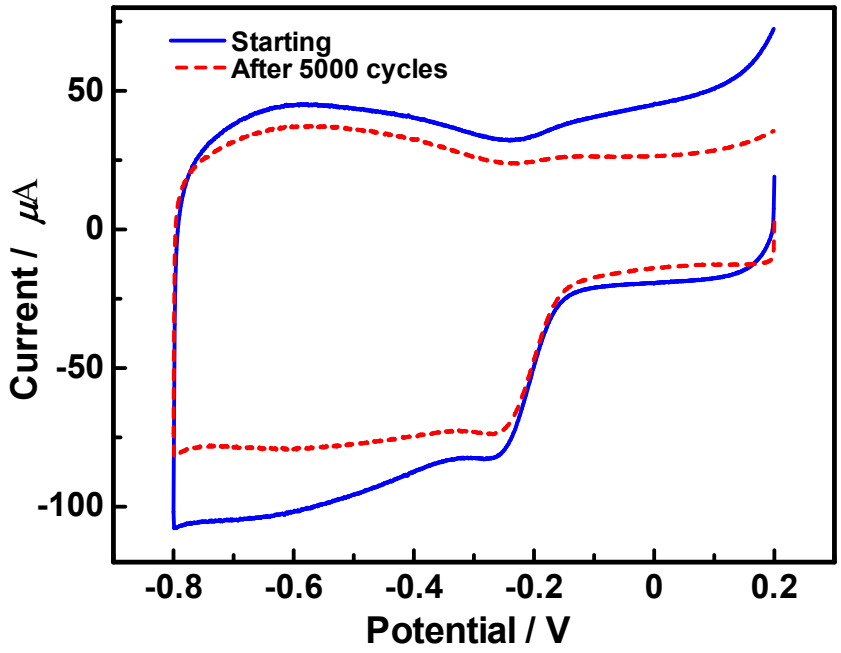

Fig. S11 Electrochemical stability of N-CD/graphene as determined by continuous cyclic voltammetry in O_2-saturated 1 M KOH.

The kinetic parameters were analyzed based on the Koutecky-Levich equation: [s1,s2]

$$\frac{1}{j} = \frac{i}{j_k} + \frac{1}{B\omega^{0.5}}$$

$$B = 0.2nF(D_{O_2})^{\frac{2}{3}}\nu^{-\frac{1}{6}}C_{O_2}$$

in which j is the measured current density, j_k is the kinetic current density, ω is the rotation rate of the electrode, n is the number of electrons transferred in oxygen reduction, F is the Faraday constant (F = 96485 C mol^{-1}), D_{O2} is the diffusion coefficient of O_2 in 1 M KOH solution (D_{O2} = 1.8×10^{-5}), v is the kinematics viscosity for 1 M KOH (v = 1.0×10^{-2} cm^2 s^{-1}), C_{O2} is the concentration of O_2 in 1 M KOH solution (C_{O2} = 7.8×10^{-7} mol cm^{-3}). [s3] The constant 0.2 is adopted when the rotation speed is expressed in rpm.

References

s1. K. P. Gong, F. Du, Z. H. Xia, M. Durstock, L. M. Dai, *Science,* 2009, *323*, 760.

s2. Y. Li, Y. Zhao, H. Cheng, Y. Hu, G. Shi, L. Dai, L. Qu, *J. Am. Chem. Soc.,* 2012, *134*, 15.

s3. J. Qiao, L. Xu, L. Ding, P. Shi, L. Zhang, R. Baker, J. Zhang, *Int. J. Electrochem. Sci.,* 2013**,** *8*, 1189.