# Supplementary Data

# N-doped Carbon Dots with high sensitivity and selectivity for hypochlorous acid detection and its application in water

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**Preparation of ROS and RNS**

Various ROS and RNS including HOCl, $H_2O_2$, TBHP, TBO·, $ONOO^-$, ·OH, $O_2^-$, $^1O_2$, $NO_2^-$, were prepared according to the following methods.

Generation of HOCl: HOCl was prepared from the source of NaOCl in 7.4 PBS buffer. The concentration of the HOCl stock solution was determined by titration of $Na_2S_2O_3$.

Generation of $H_2O_2$: The $H_2O_2$ stock solution was purchased from Chengdu Kelong Chemical Factory. The concentration of $H_2O_2$ was titrated according to iodometry.

Generation of TBHP: A 10 mM stock solution of t-BuOOH was firstly prepared in anhydrous ethanol and then added into the probe testing solution.

Generation of tert-butoxy radical (TBO·): TBO· were generated by Fenton reaction of TBHP with $Fe^{2+}$.[1]

Generation of peroxynitrite ($ONOO^-$): Peroxynitrite solution was synthesized as reported.[2] Firstly, hydrogen peroxide (0.7 M) was acidified with hydrochloric acid (0.6 M), the mixture solution and sodium nitrite (0.6 M) was added into sodium hydroxide (1.25 M) simultaneously. Then 0.08 g $MnO_2$ was added with vigorously stirring at room temperature to remove the superfluous $H_2O_2$. After the filtration the resulting solution was stored at lower than -18 °C.The

concentration of the $ONOO^-$ stock solution was determined by measuring the absorbance at 302 nm with a molar extinction coefficient of 1670 $M^{-1}\cdot cm^{-1}$.

Generation of ·OH: Hydroxyl radical (·OH) was generated in the Fenton system from ferrous sulfate and hydrogen peroxide.

Generation of superoxide solution ($\cdot O_2^-$): $\cdot O_2^-$ was prepared by adding $KO_2$ to dry dimethyl sulfoxide and stirring vigorously for 2 min.[3]

Generation of singlet oxygen ($^1O_2$): $^1O_2$ was produced from the $H_2O_2/NaMoO_4$ system.[1]

Generation of $NO_2^-$: $NaNO_2$ was used as $NO_2^-$ source.

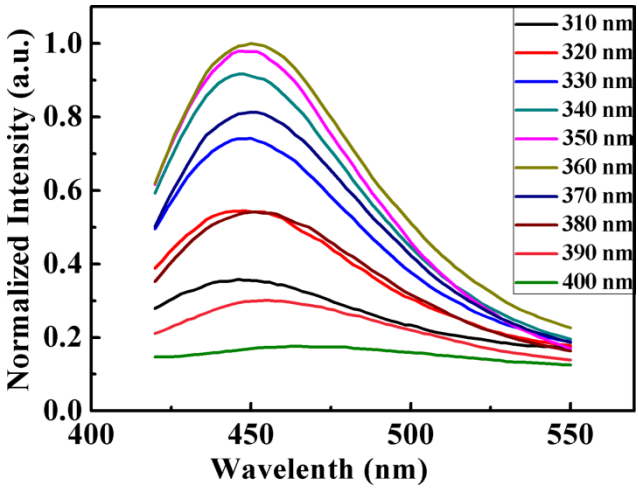


Fig. S1 Emission spectra of N-doped CDs at different excitation wavelength.

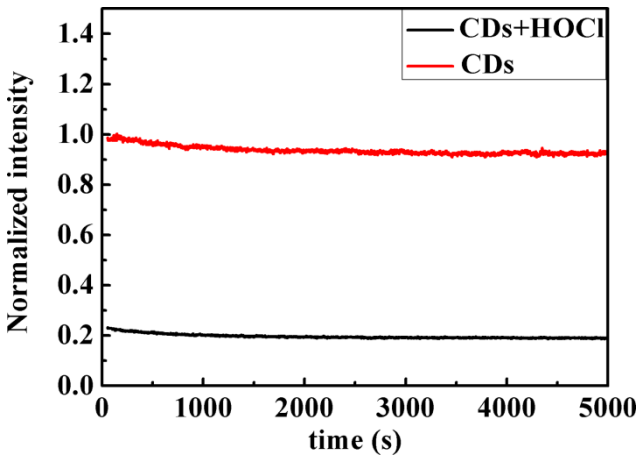


Fig. S2. The time-dependent fluorescence intensity of N-doped CDs (12 μg·$mL^{-1}$) in the absence (red line) and presence (black line) of 20 μM HOCl in PBS solution (50 mM, pH = 7.4). ($\lambda_{ex}$ = 360 nm, $\lambda_{em}$ = 448 nm).

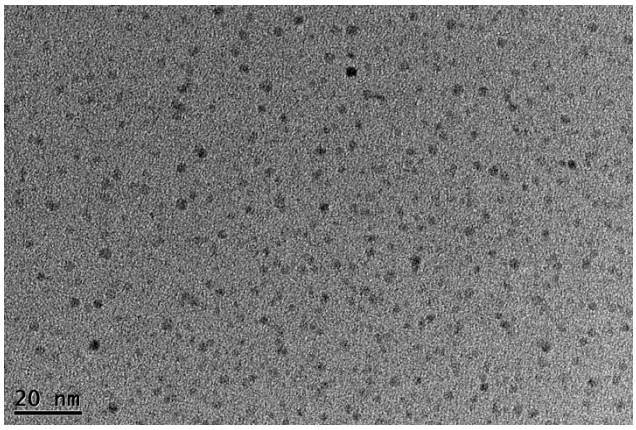


Fig. S3. TEM image of N-free CDs.

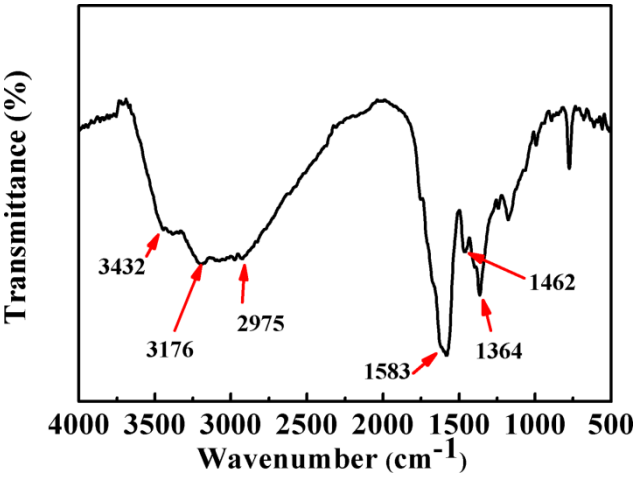


Fig. S4. The FT-IR spectrum of the N-doped CDs.

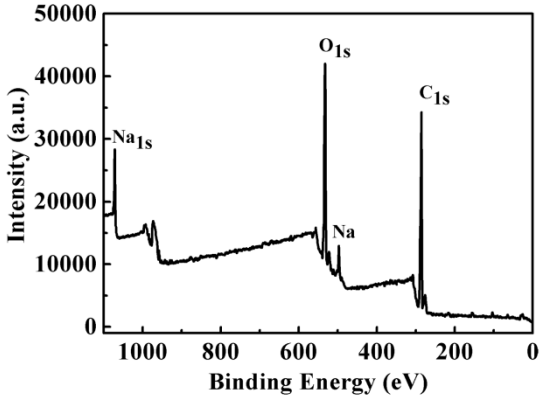


Fig. S5. XPS spectrum of N-free CDs.

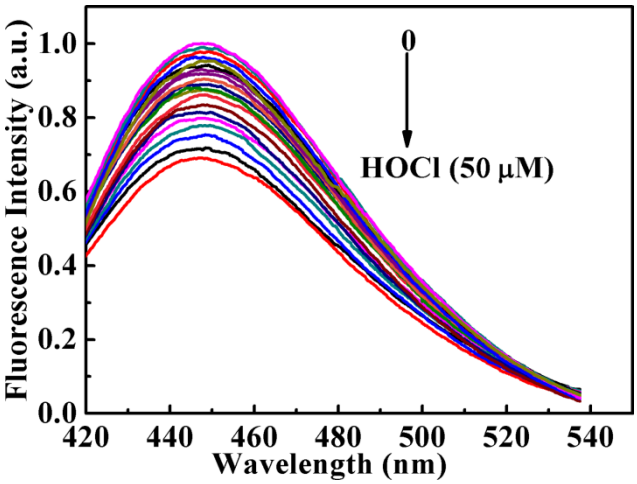


Fig. S6 Fluorescence spectra of N-free CDs in the presence of various concentrations of HOCl.

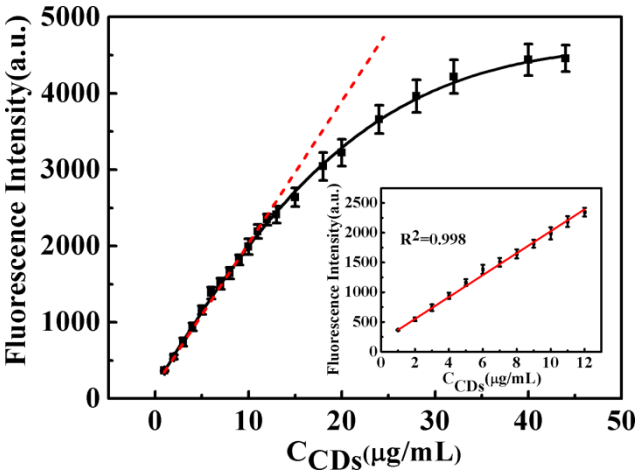


Fig. S7. Concentration-dependent of fluorescence response of N-doped CDs in PBS solution (50 mM, pH =7.4). The inset showed the linear response of fluorescence intensity versus the concentration of N-doped CDs. The error bar represented the standard deviation of three measurements.

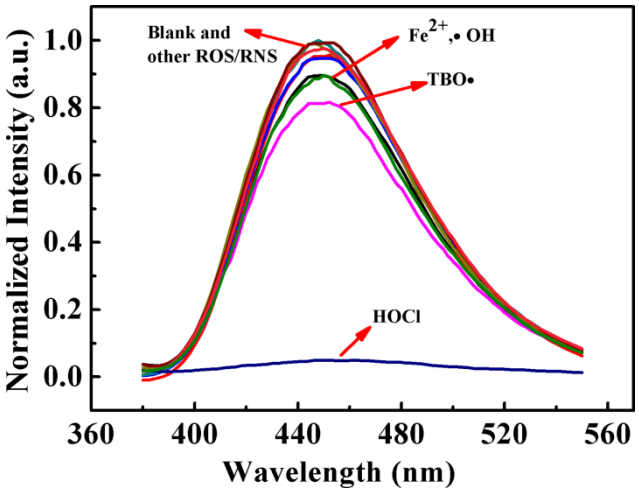


Fig. S8. Fluorescence responses of N-doped CDs (12 μg·mL$^{-1}$) to various ROS/RNS in PBS solution (50 mM, pH=7.4) ($\lambda_{ex}$ = 360 nm). ROS/RNS including: TBHP (200 μM), TBO· (200 μM), $H_2O_2$ (500 μM), $^1O_2$ (200 μM), $\cdot O_2^-$ (200 μM), $ONOO^-$ (100 μM), $NO_2^-$ (500 μM), ·OH (80 μM), HOCl (30 μM).

## References

1. G. Chen, F. Song, J. Wang, Z. Yang, S. Sun, J. Fan, X. Qiang, X. Wang, B. Dou and X. Peng, *Chem. Commun.*, 2012, 48, 2949-2951.

2. J. W. Reed, H. H. Ho and W. L. Jolly, *J. Am. Chem. Soc.*, 1974, 96, 1248-1249.

3. A. R. Lippert, E. J. New and C. J. Chang, *J. Am. Chem. Soc.*, 2011, 133, 10078-10080.