Supplementary Information

# One-step synthesis of red/green dual-emission carbon dots for ratiometric sensitive $ONOO^-$ probing and cell imaging

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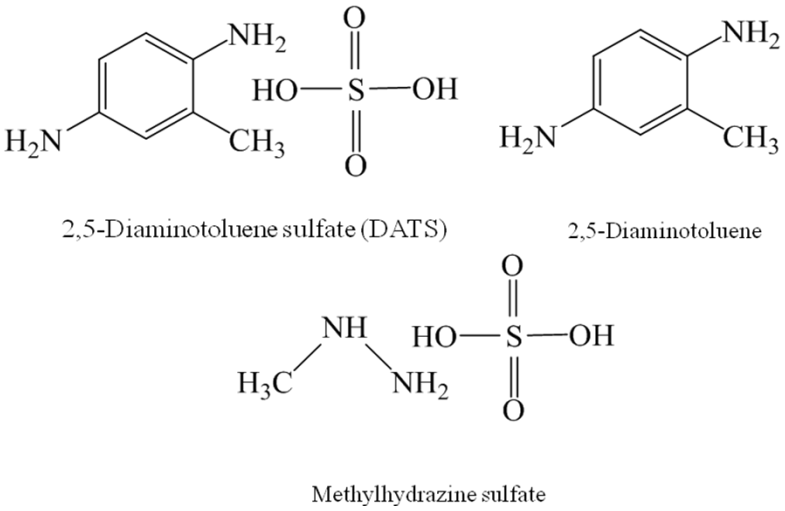


**Scheme S1.** Structural formulas of 2,5-diaminotoluene sulfate, 2,5-diaminotoluene and methylhydrazine sulfate.

**Table S1.** Comparation of the properties of the RGDE CDs with other CDs.

| Synthetic raw material | Single/dual emission | Excitation wavelength (nm) | Emission wavelength (nm) | QY (%) | Reference |
|---|---|---|---|---|---|
| citric acid, urea, sodium fluoride | single | 530 | 600 | 1.20 | 1 |
| citric acid, neutral red | single | 530 | 632 | 12.1 | 2 |
| p-phenylenediamine | single | 470 | 620 | 15.0 | 3 |
| ascorbic acid, ethylene glycol | dual | 365 | 435/538 | not mentioned | 4 |
| m-phenylenediamine, sulfuric acid | dual | 300 | 360/520 | 43.0 (460 nm excitation) | 5 |
| citric acid, urea | dual | 380 | 455/520 | 14.0 (420 nm excitation) | 6, 7 |
| 2,5-diaminotoluene sulfate | dual | 380 | 525/603 | 9.00 (380 nm excitation) | this work |

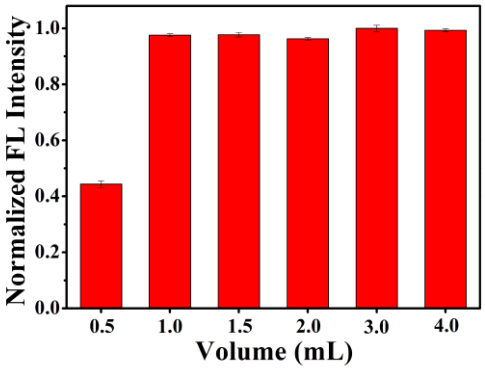


**Fig. S1.** Effect of ethanol volume on the fluorescence intensity (603 nm) of the RGDE CDs.

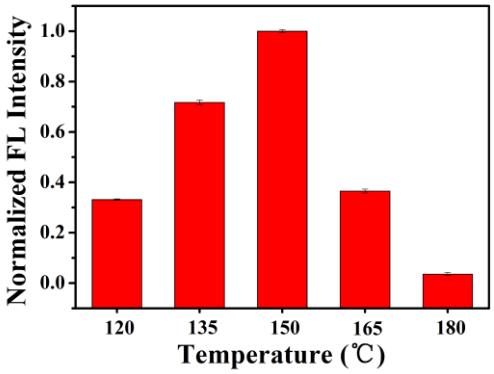


**Fig. S2.** Effect of reaction temperature on the fluorescence intensity (603 nm) of the RGDE CDs.

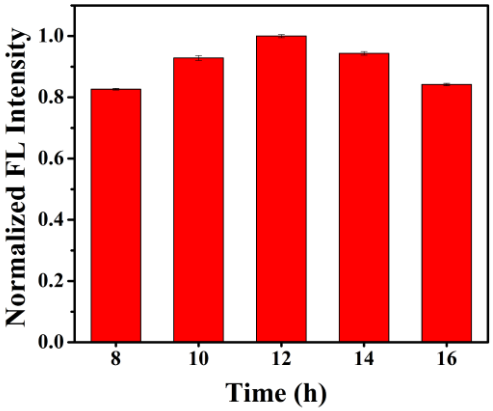


**Fig. S3.** Effect of reaction time on the fluorescence intensity (603 nm) of the RGDE CDs.

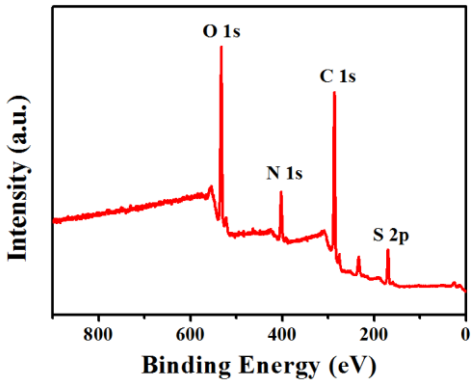


**Fig. S4.** XPS full-scan spectrum of the RGDE CDs.

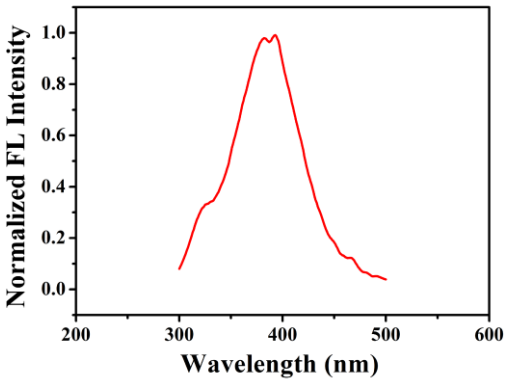


**Fig. S5.** Fluorescence excitation spectrum of the RGDE CDs.

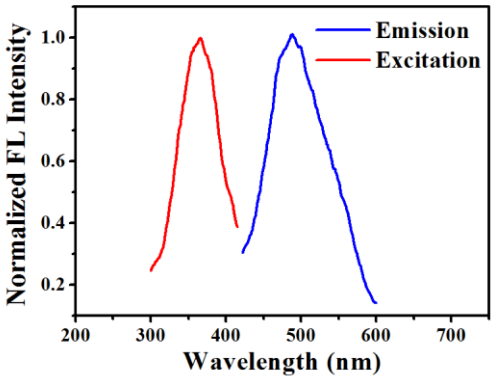


**Fig. S6.** Fluorescence excitation and emission spectra of the CDs prepared through using 2,5-diaminotoluene as carbon source.

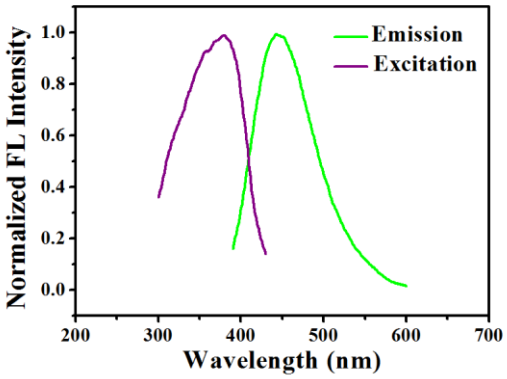


**Fig. S7.** Fluorescence excitation and emission spectra of the CDs prepared through using methylhydrazine sulfate as carbon source.

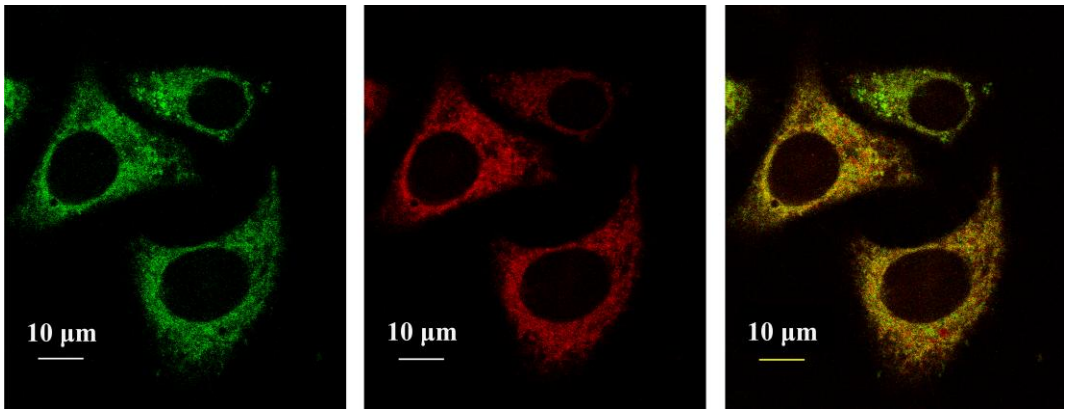


**Fig. S8.** Confocal microscopy fluorescence images of HeLa cells treated with the RGDE CDs (30 µg/mL) in green channel, red channel and merged image of green and red channel. Scale bar is 10 µm.

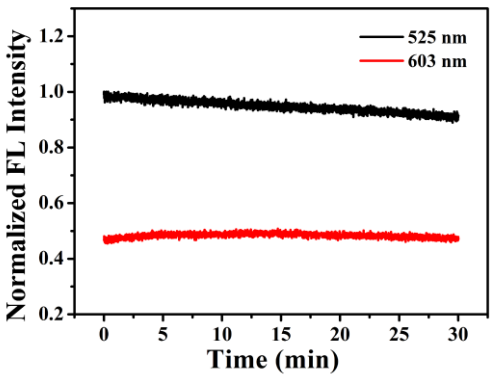


**Fig. S9.** Effect of light illumination time on the fluorescence intensity of the RGDE CDs.

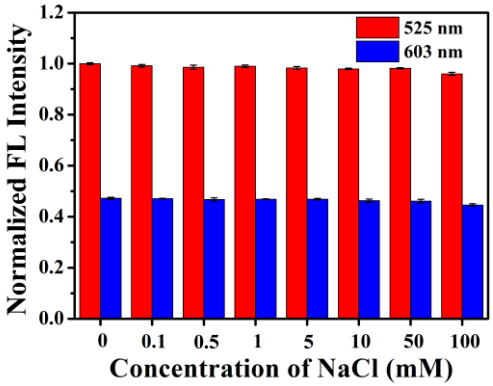


**Fig. S10.** Effect of concentration of NaCl solution on the fluorescence intensity of the RGDE CDs.

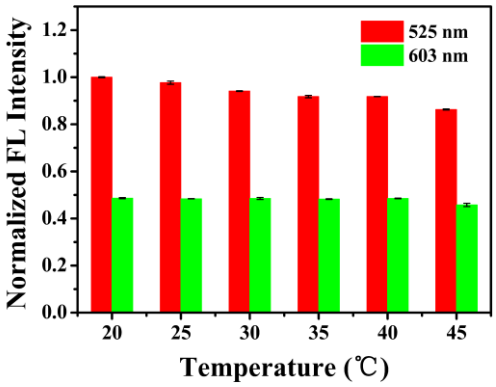


**Fig. S11.** Effect of environmental temperature on the fluorescence intensity of the RGDE CDs.

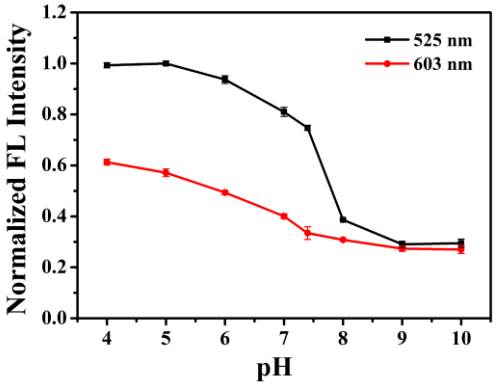


**Fig. S12.** Effect of pH of buffer solution on the fluorescence intensity of the RGDE CDs.

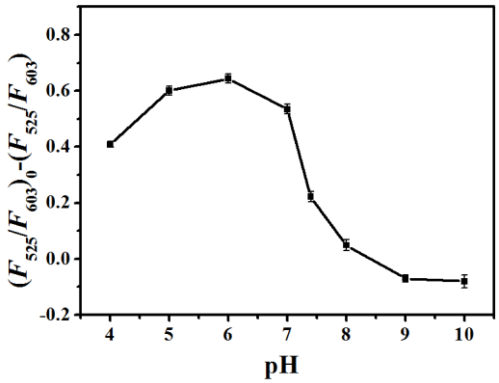


**Fig. S13.** Effect of pH of buffer solution on $(F_{525}/F_{603})_0$ and $(F_{525}/F_{603})$. $(F_{525}/F_{603})_0$ and $(F_{525}/F_{603})$ were the fluorescence intensity ratios of the RGDE CDs solution in the absence and presence of 22 μM $ONOO^-$, respectively.

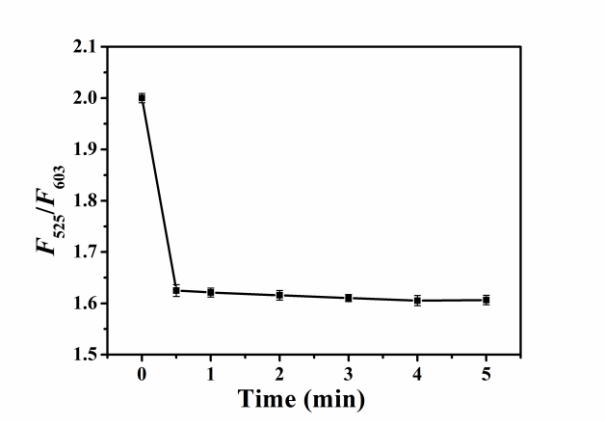


**Fig. S14.** Time-dependent fluorescence intensity of the RGDE CDs with the addition of 22 μM $ONOO^-$ at room temperature.

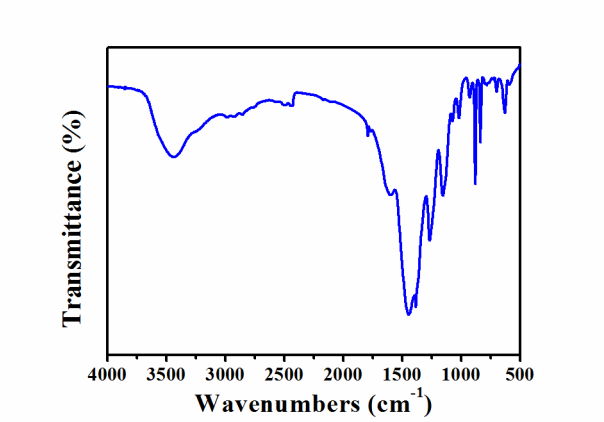


**Fig. S15.** FT-IR spectrum of the RGDE CDs in the presence of $ONOO^-$ .

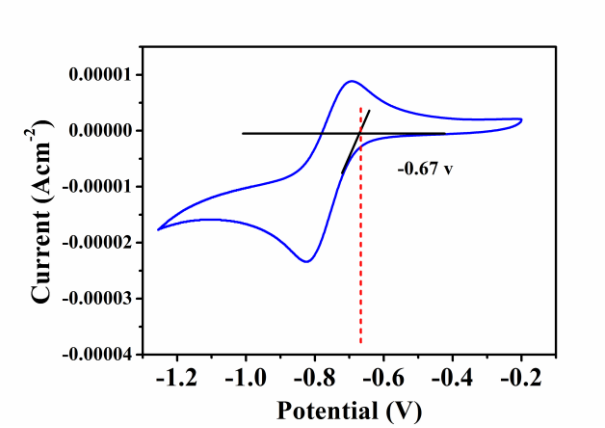


**Fig. S16.** Cyclic voltammograms of the RGDE CDs in the solution state (solvent: freshly dried dimethylformamide).

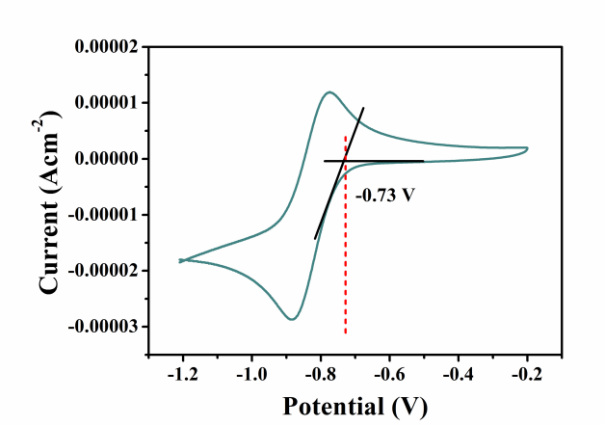


**Fig. S17.** Cyclic voltammograms of $ONOO^-$ in the solution state (solvent: freshly dried dimethylformamide).

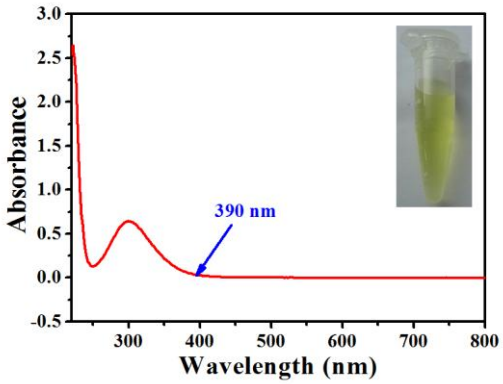


**Fig. S18.** UV-vis absorption spectrum of $ONOO^-$, inset was the photograph of $ONOO^-$ solution under visible light.

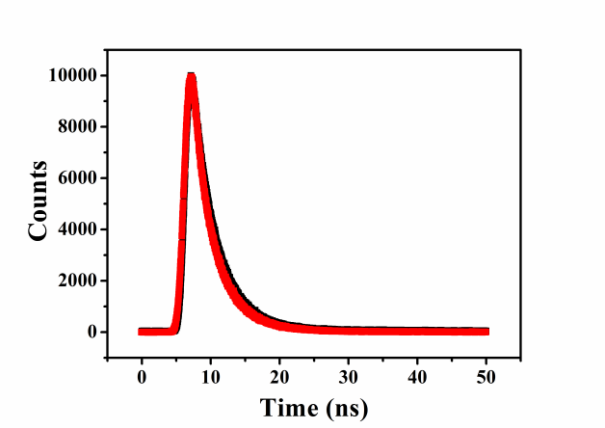


**Fig. S19.** Time-resolved decays of the RGDE CDs in the absence (black line) and presence (red line) of $ONOO^-$.

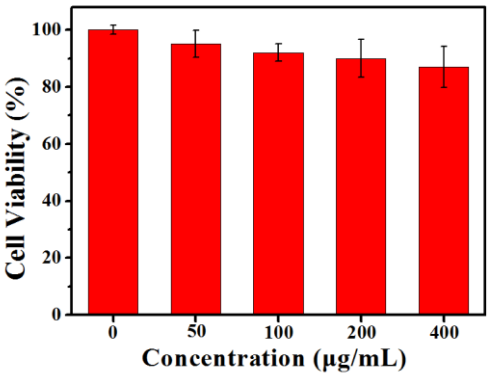


**Fig. S20.** Cell viability of HeLa cells with different concentrations of the RGDE CDs.

**Quantum yield (QY) measurements.**

QY of the obtained RGDE CDs was determined by the method mentioned in our previous work.[8] The absolute photoluminescence quantum yield can be represented simple in the equation below:

$$QY = \frac{\int L_{emission}}{\int E_{solvent} - \int E_{sample}} \qquad (1)$$

where QY was the absolute quantum yield, $L_{emission}$ was the fluorescence (FL) emission spectrum of the RGDE CDs sample, collected using the sphere; $E_{sample}$ was the spectrum of the light used to excite the sample, collected using the sphere; $E_{solvent}$ was the spectrum of the light used for excitation with only the solvent in the sphere, collected using the sphere. The solvent in this experiment was deionized water.

**References**


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