Electronic Supplementary Material (ESI) for Analyst.


# Synthesis of "amphiphilic" carbon dots and their applications for the analysis of iodine species ($I_2$, $I^-$ and $IO_3^-$) in high saline water

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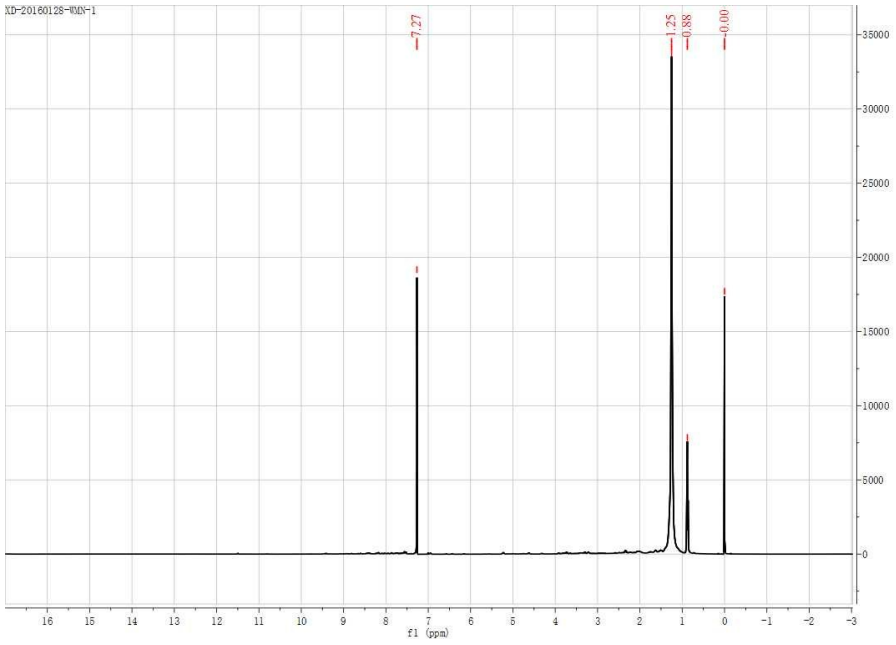


Fig. S1 The 1H NMR spectrum of A-CDs.

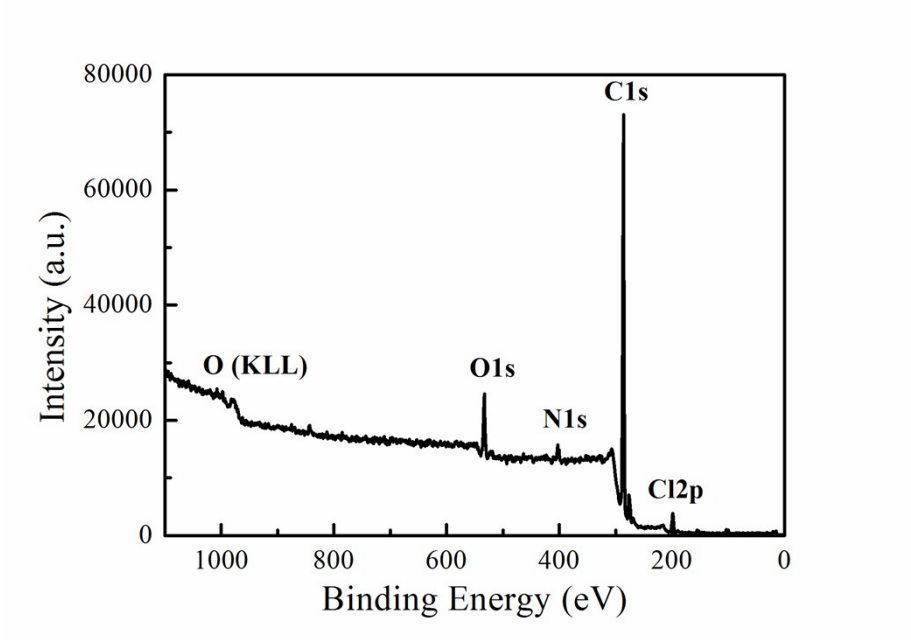


**Fig. S2** The XPS spectrum of A-CDs.

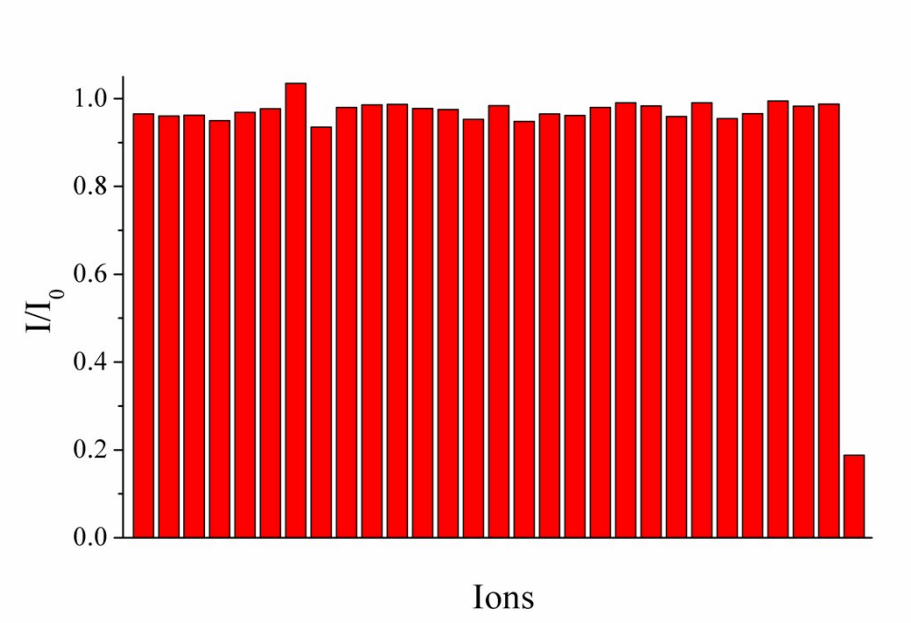


**Fig.S3** The response of A-CDs to 29 kinds of ions (from left to right: $Ag^{+}$, $Al^{3+}$, $Ba^{2+}$, $Ca^{2+}$, $Cd^{2+}$, $Co^{2+}$, $Cr^{3+}$, $Cu^{2+}$, $Fe^{3+}$, $K^{+}$, $Hg^{2+}$, $Mg^{2+}$, $Mn^{2+}$, $Ni^{2+}$, $Pb^{2+}$, $Zn^{2+}$, $F^{-}$, $Cl^{-}$, $Br^{-}$, $S^{2-}$, $ClO_4^{-}$, $SO_4^{2-}$, $NO_3^{-}$, $NO_2^{-}$, $C_6H_5O_7^{3-}$, $CH_3COO^{-}$, $IO_3^{-}$, $I^{-}$, $I_2$).

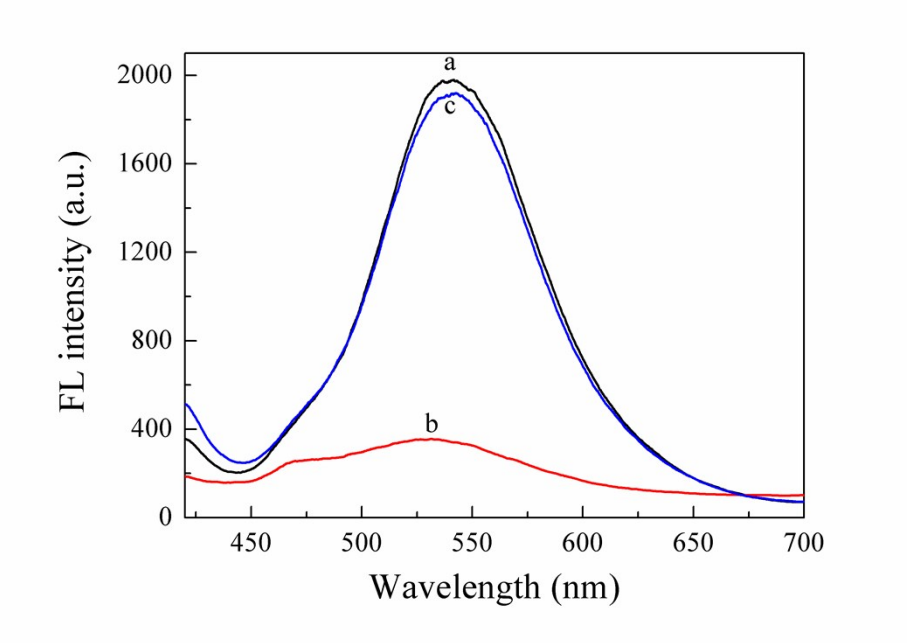


**Fig.S4** Fluorescence intensity of A-CDs changes before (curve a) and after (curve b) adding $I_2$, and the fluorescence recovery after the addition of excess $Na_2SO_3$ (curve c).

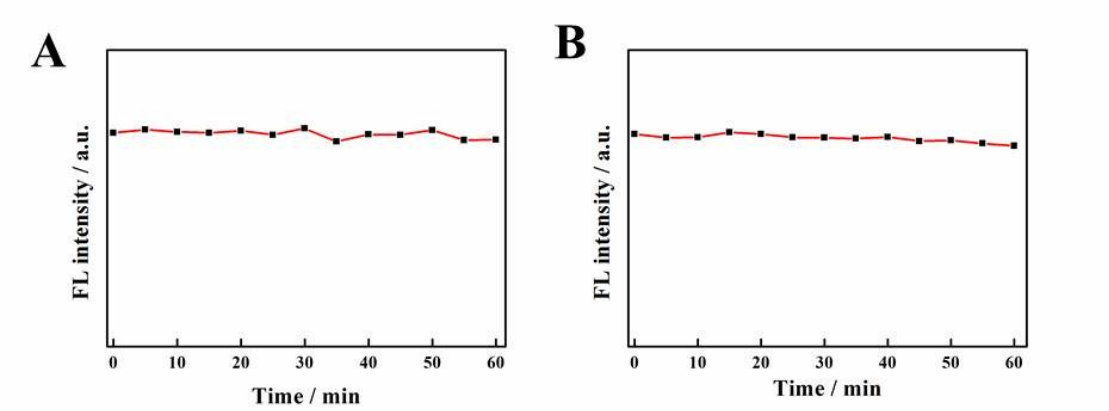


Fig.S5 The influence of $Na_2SO_3$ (A) and $H_2O_2$ (B) on the fluorescence intensity of A-CDs. ($[Na_2SO_3]$ =0.5 mM; $[H_2O_2]$ =50 mM).

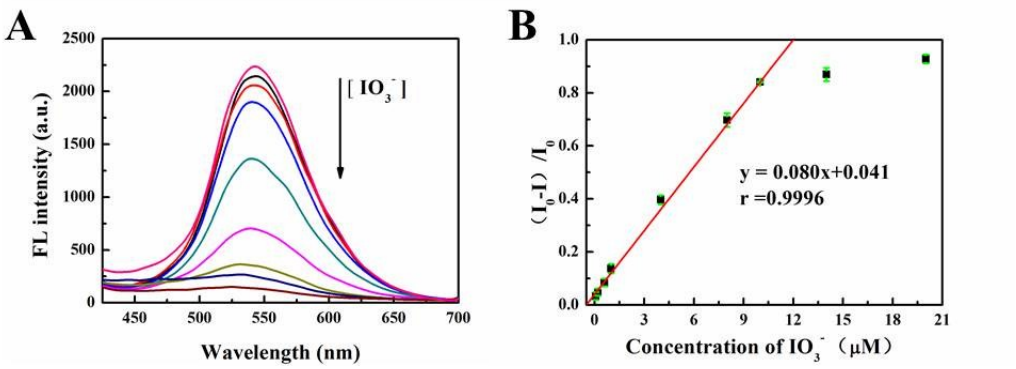


Fig.S6 (A) The fluorescence spectra changes of A-CDs upon the addition of $IO_3^-$ (80 nM-20 μM) in aqueous solution with an excitation at 360 nm at pH=1.0; (B) show the plots of relative fluorescence $(I_0-I)/I_0$ versus the concentration of $IO_3^-$ (Error bars, SD, n=3).

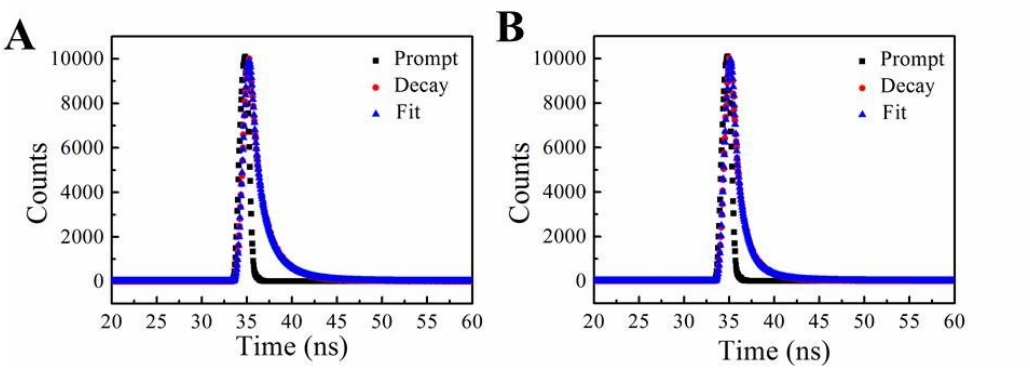


Fig.S7 The fluorescence lifetime of A-CDs before (A) and after (B) the presence of $I_2$.

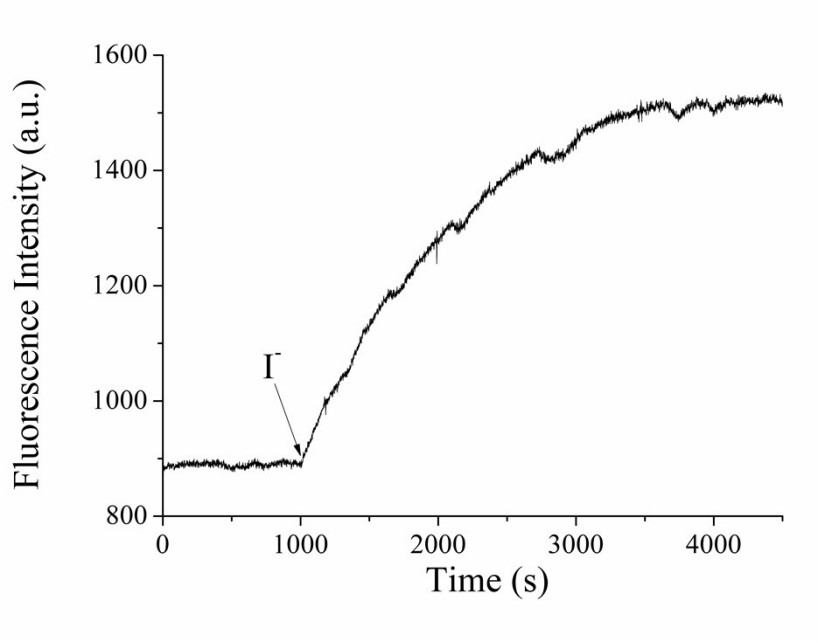


**Fig.S8** The fluorescence intensity changes of A-CDs after the addition of excess $I^-$ into the system of A-CDs-$I_2$

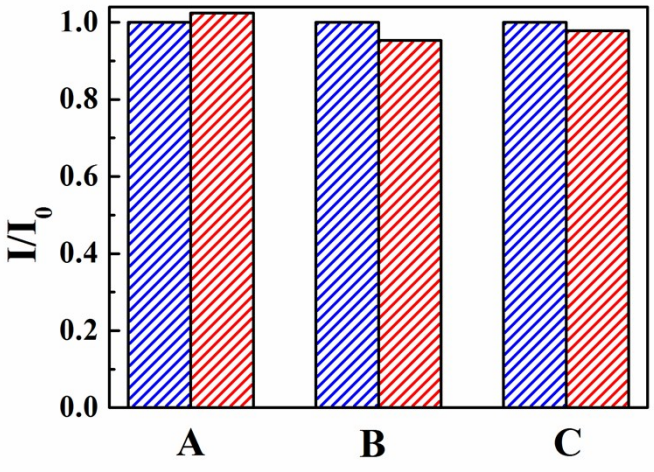


**Fig.S9** The response of hydrophilic carbon dots to $I_2$, the carbon dots was synthesized from sucrose,[1] and only with hydrophilic groups (-OH and -COOH) on the surface. A, B and C refer to the response of hydrophilic carbon dots to $I_2$, $I^-$ and $IO_3^-$ ($10^{-5}$ M), respectively; blue and red columns are fluorescence signal changes before and after the addition of $I_2$, $I^-$ and $IO_3^-$ in the system, respectively.

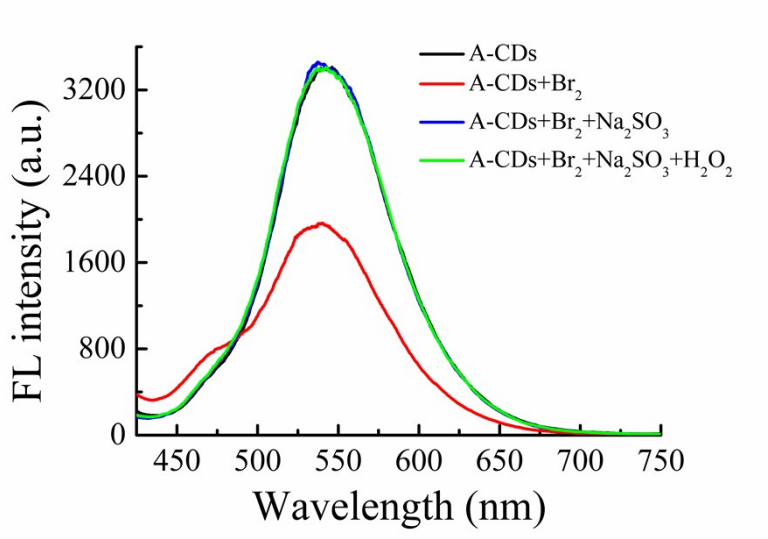


Fig.S10 The fluorescent spectrum of A-CDs (black curve), A-CDs with $Br_2$ present (red curve), A-CDs with $Br_2$ and $Na_2SO_3$ present (blue curve), A-CDs with $Br_2$, $Na_2SO_3$ and $H_2O_2$ present (green curve). The concentration of $Br_2$ is $10^{-5}$ M.

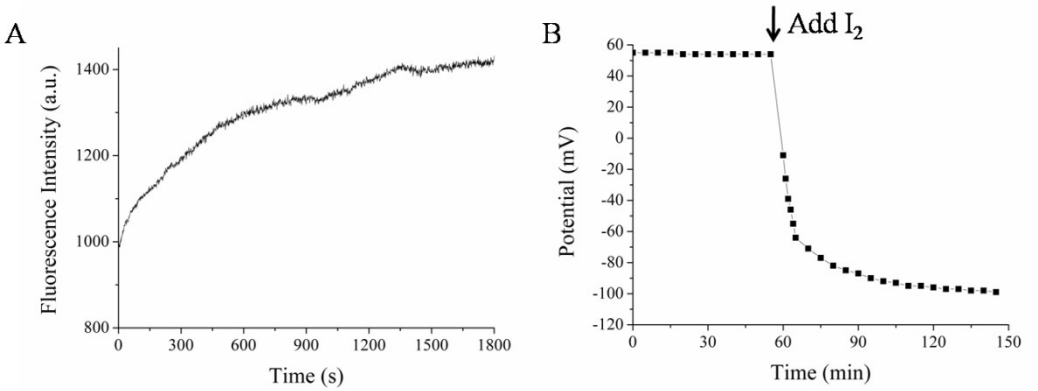


**Fig.S11** (A) The fluorescence recovery of A-CDs with time extension with the present of $I_2$ in the system; (B) the measurement of $I^-$ in the system with iodide ion selective electrode.

Table S1. The zeta potentials of A-CDs in water at different pH.

| pH | 1.0 | 2.0 | 4.0 | 7.0 | 10.0 |
|---|---|---|---|---|---|
| Zeta potential (mV) | 24.9 | 48.1 | 46.9 | 29.9 | 15.7 |

Table S2. The zeta potentials of A-CDs in water with the presence of $Na_2SO_3$ and $H_2O_2$ (pH=1).

| Concentration | | Zeta potential (mV) |
|---|---|---|
| $Na_2SO_3$ | 10 mM | 29.3 |
| | 5 mM | 26.8 |
| | 1 mM | 22.5 |
| $H_2O_2$ | 0.1 M | 23.8 |
| | 0.05 M | 23.2 |
| | 0.01 M | 24.1 |

**Table S3**. Determination of iodine in brine water, urine and edible saltsamples

| Samples | Measuringiodine (mg/L) (n=3) | Spiked (mg/L ) | Found(mg/L ) (n=3) | Recovery ( % ) | Iodine content of stock solution | Standard range |
|---|---|---|---|---|---|---|
| Brine water | 0.337±0.001 | 0.127 | 0.462±0.005 | 98 | 1.35mg/L | 1.2-1.6 mg/L[a] |
| Urine | 0.130±0.003 | 0.127 | 0.258±0.002 | 101 | 0.130 mg/L | 100-200 μg/L[b] |
| Edible salt | 0.261±0.001 | 0.127 | 0.389±0.003 | 101 | 26.1mg/kg | 21-39 mg/kg[c] |

[a] The data from Jinlu Corporation Ltd., Sichuan, China.
[b] For a healthy human being, urinary iodide should be in the range of 100-200μg/L according to the WHO.
[c] Iodine content of the standard range of products.

## References:

1. S. Chandra, P. Das, S. Bag, Laha,D. and P. Pramanik, *Nanoscale*, 2011**,3**, 1533.