Electronic Supplementary Information

Portable smartphone platform based on fluorescent carbon quantum dots derived from biowaste for on-site detection of permanganate

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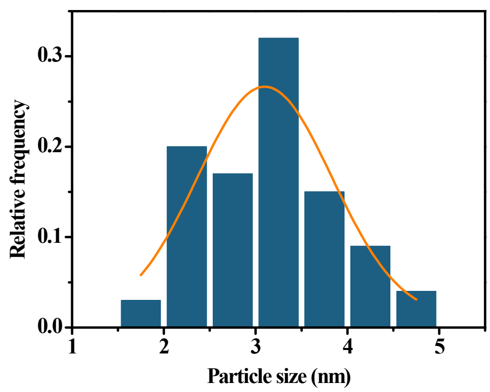

Fig. S1 Size distribution of CQDs (Average diameter=3.14 ± 0.71 nm)

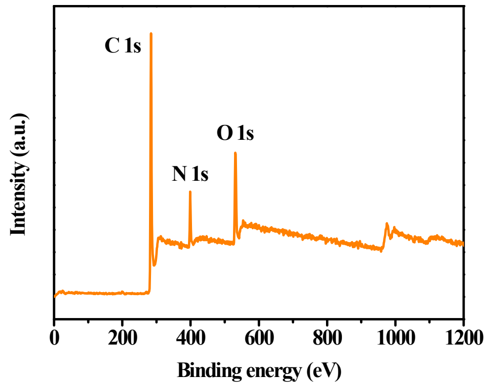

Fig. S2 XPS survey scan of CQDs

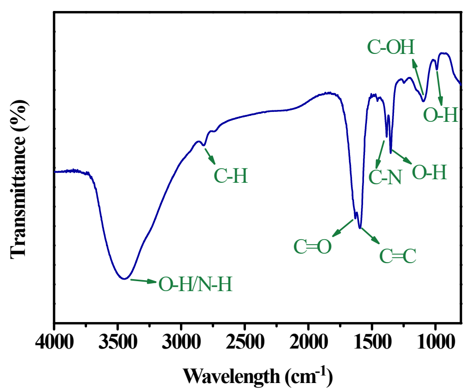

Fig. S3 FT-IR spectrum of CQDs.

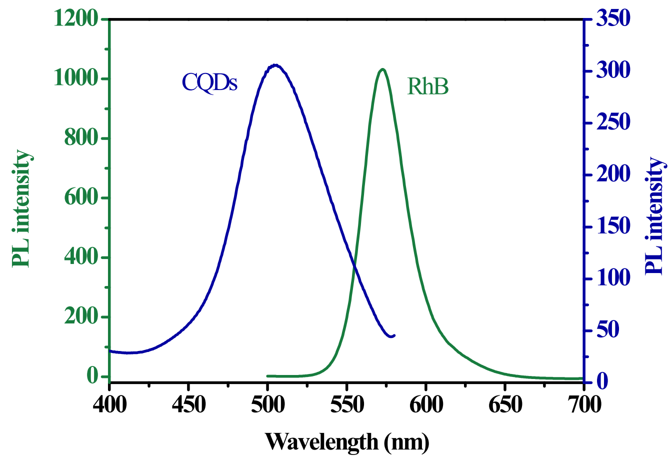

Fig. S4 PL spectrum of CQDs and Rhodamine B

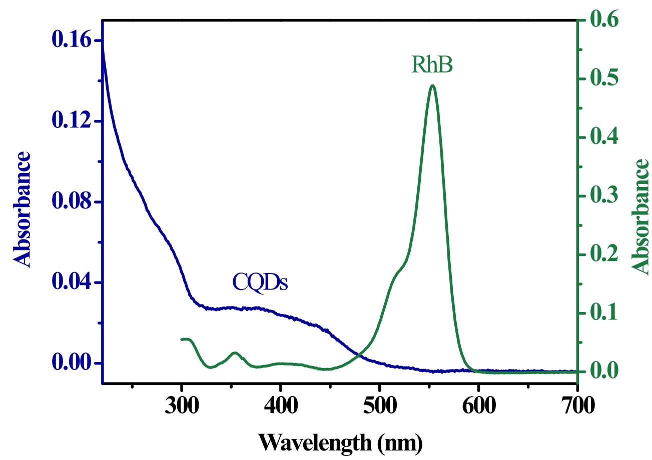

Fig. S5 UV-vis spectrum of CQDs and Rhodamine B (RhB)

Table S1. Quantum yield of the CQDs.

Sample	Abs. at 360nm	PL Integrated intensity	Refractive index of solvent (n)	PLQY (%)
RhB	0.0246	38790.29	1.33	31
CQDs	0.0265	17330.45	1.33	12.86

Table S2. A comparison of fluorescence quantum yields (QY) exhibited by CQDs.

Quantum dots	QY (%)	References
Ionic liquids modifed carbon quantum dots (ILs-CQDs)	18.13	[1]
Carbon quantum dots (CQDs)	11.37	[2]
Carbon quantum dots (CQDs)	16.2	[3]
Carbon quantum dots (CQDs)	10.36	[4]
N-doped carbon quantum dots (CQDs)	9	[5]
Nitrogen doped carbon quantum dots (N-CQDs)	12.33	[6]
Nitrogen doped carbon quantum dot (N-CQDs)	14.81	[7]
Nitrogen doped carbon quantum dot (N-CQDs)	9.3	[8]
Carbon quantum dots (CQDs)	3.5	[9]
Lotus stem-derived carbon dots (LS-CQDs)	0.44	[10]
Carbon quantum dots (CQDs)	14.12	[11]
CQDs	12.86	This work

Table S3. Comparison of the performance of different methods for MnO_4^- detection.

Fluorescent probes	LOD	References
ILs-CQDs	0.09 μM	[1]
CQDs	0.06 μM	[4]
Luminescent lanthanide metal-organic frameworks (Ln-MOFs)	3.53 μM	[12]
Red emission carbon dots (RCDs)	14.5 nM	[13]
Manganese-doped carbon dots (Mn-CDs)	0.66 μM	[14]
Covalent organic framework (COF)	0.01 mM	[15]
$[Zn(2,2'\text{-bipy})(ppa)(H_2O)_2]\cdot 2H_2O$	6.73 μM	[16]
$[Co(NPDC)(bpee)]\cdot DMF\cdot 2H_2O$	1.50 μM	[17]
$\{[Eu_2Na(Hpdbb)(pdbb)_2(CH_3COO)_2]\cdot 2.5DMA\}_n$	5.99 μM	[18]
Carbon nanospheres (CNs)	0.72 μM	[19]
CQDs	3.31 μM	This work

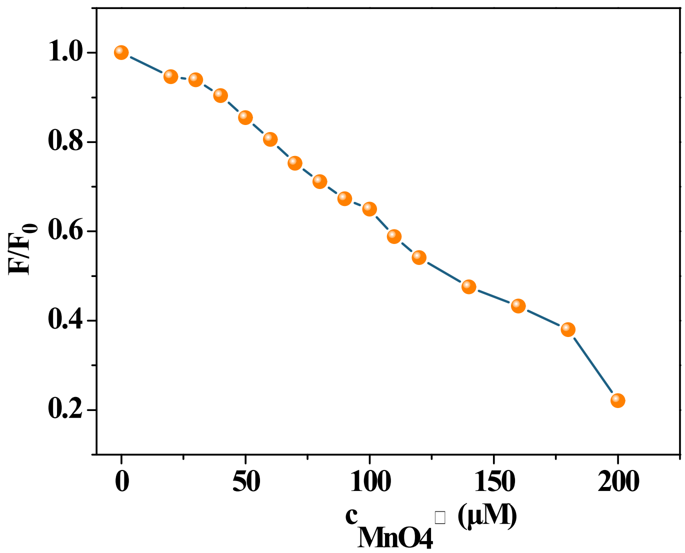

Fig. S6 Relationship between fluorescence intensity and different MnO_4^- concentrations.

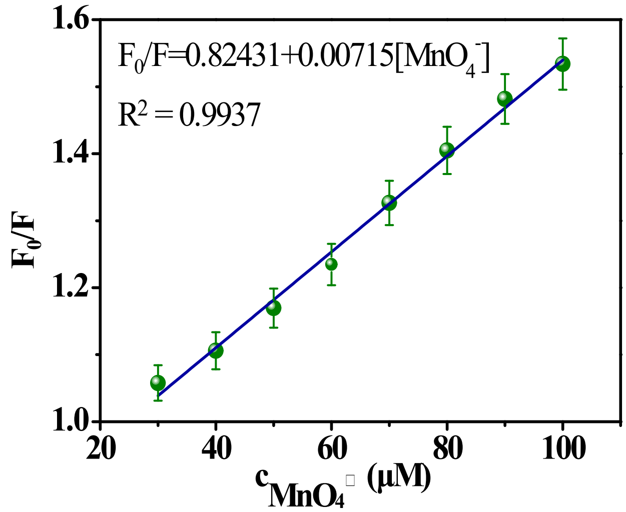

Fig. S7 Linear plots of different concentrations of MnO_4^- versus F_0/F.

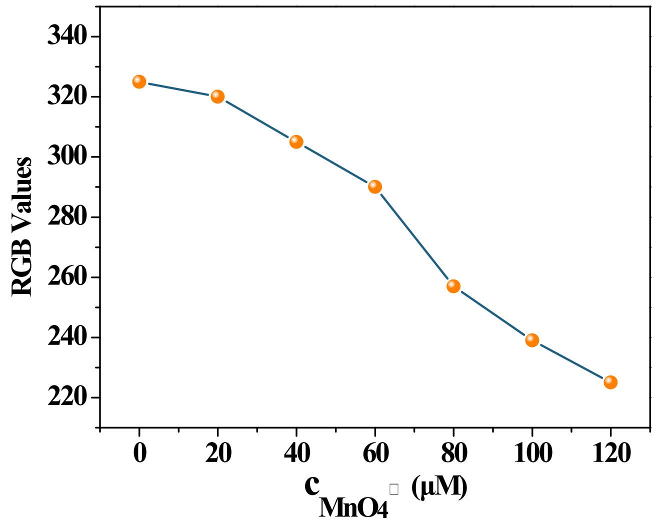

Fig. S8 The relationship between RGB values and MnO_4^- concentrations

Table S4. Recoveries of MnO_4^- in water samples based on smartphone sensing platform (n = 3).

Sample	Added (μM)	Found (μM)	Recovery (%)	RSD (%)
Tap water	0	NF	-	-
	40	39.35	98.38	4.02
	70	68.34	97.63	4.94
	80	82.78	103.48	3.56
River water	0	NF	-	-
	40	39.76	99.40	3.69
	70	68.73	98.19	4.27
	80	84.01	105.01	5.19

Note: NF=Not found

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