Supporting Information

Fluorescent N-functionalized carbon nanodots from carboxymethylcellulose for sensing of high-valence metal ions and cell imaging

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Table S1. QY of carbon dots prepared under various reaction conditions

Samples	CMC/N source (mass ratio)	Temperature (ºC)	Time (h)	QYs (%)
CDs[a]	1:0	220	36	4.9
N-CDs[b]	1:0.15	220	36	13.1
N-CDs[b]	1:0.45	220	36	19.2
N-CDs[b]	1:0.75	220	36	22.9
N-CDs[b]	1:0.90	220	36	21.6
N-CDs[b]	1:0.75	180	36	7.8
N-CDs[b]	1:0.75	200	36	13.1
N-CDs[b]	1:0.75	240	36	21.7
N-CDs[c]	1:0.75	220	36	15.4
N-CDs[d]	1:0.75	220	36	14.7
N-CDs[e]	1:0.75	220	36	10.9
N-CDs[f]	1:0.75	220	36	13.4

Reaction conditions: [a] CMC (M.W. 90000 g/mol); [b] CMC (M.W. 90000 g/mol), ethylenediamine (EDA); [c] CMC (M.W. 250000 g/mol), ethylenediamine (EDA); [d] CMC (M.W. 700000 g/mol), ethylenediamine (EDA); [e] CMC (M.W. 90000 g/mol), 1,2-propanediamine; [f] CMC (M.W. 90000 g/mol), 1,6-hexamethylenediamine.

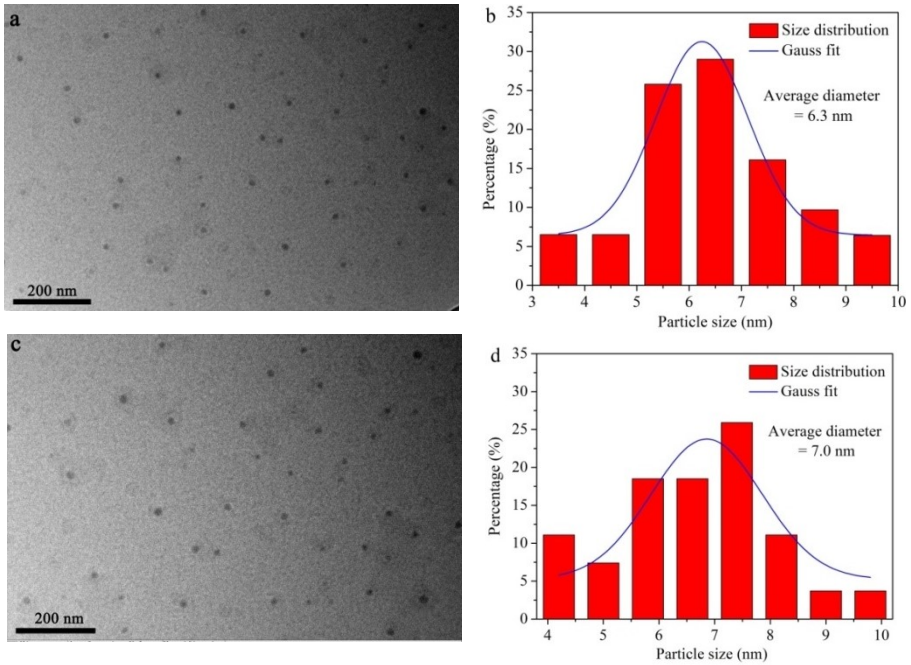

Fig. S1 TEM images and particle size distributions of N-CDs samples. Conditions: (a, b) CMC (M.W. 250000 g/mol), (c, d) CMC (M.W. 700000 g/mol).

Table S2. The contents of C, O and N elements in CMC, CDs and N-CDs samples by XPS analysis

Elemental composition	Samples		
	CMC	CDs	N-CDs
C	57.98%	61.10%	68.75%
O	40.22%	29.28%	11.90%
N	-	-	19.35%

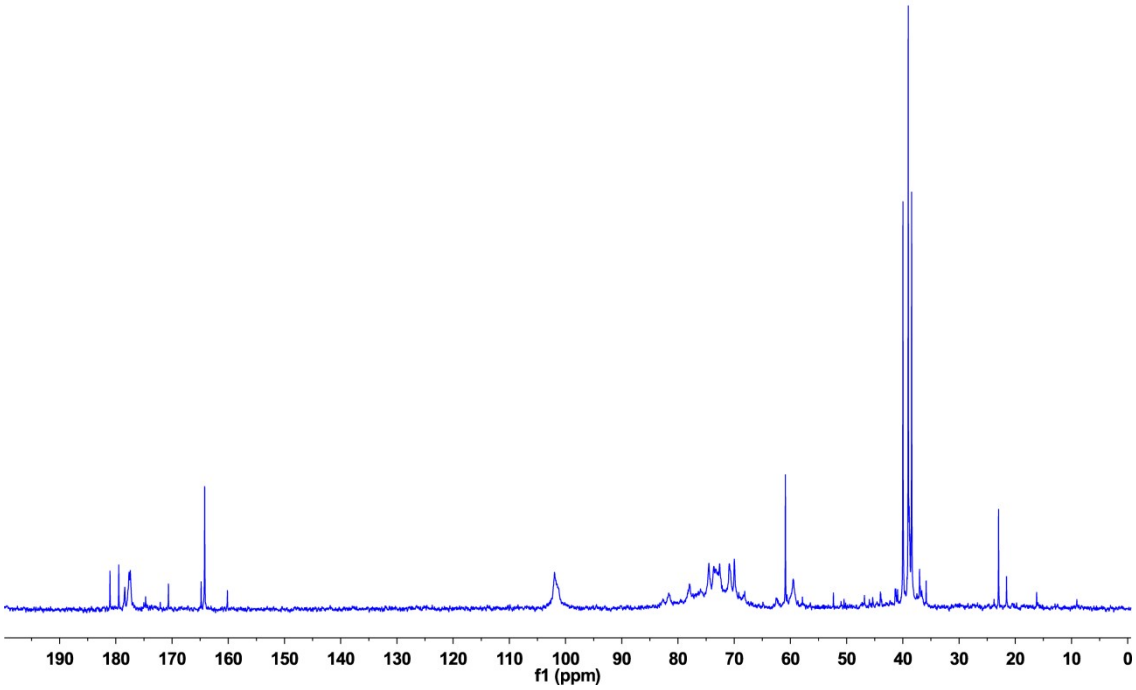

Fig. S2 ^{13}C-NMR spectrum of N-CDs in D_2O.

Table S3. Fe^{3+} sensing comparison with other sensors.

Sources	Passivators	Linear range (μM)	K_{SV} (M^{-1})	LOD (μM)	Ref.
Alginic acid	Ethanediamine	0-50	2390	10.98	[S1]
Vitamin B1	Ethylenediamine	0.1-1000	-	0.177	[S2]
pyrocatechol	Ethylenediamine	5-600	-	1.20	[S3]
graphite	-	10-200	-	1.80	[S4]
L-glutamic acid	-	0-50	-	4.67	[S5]
P. acidus fruits	Ammonia	2-25	-	0.90	[S6]
Blueberry	-	12.5-100	3148	9.97	[S7]
α-cyclodextrin	-	16-166	-	6.05	[S8]
P. avium fruits	Ammonia	0-100	2095.8	0.96	[S9]
DL-malic acid	Ethanolamine	6-200	2460	0.80	[S10]
CMC	Ethylenediamine	0-1000	4550	0.8	This work

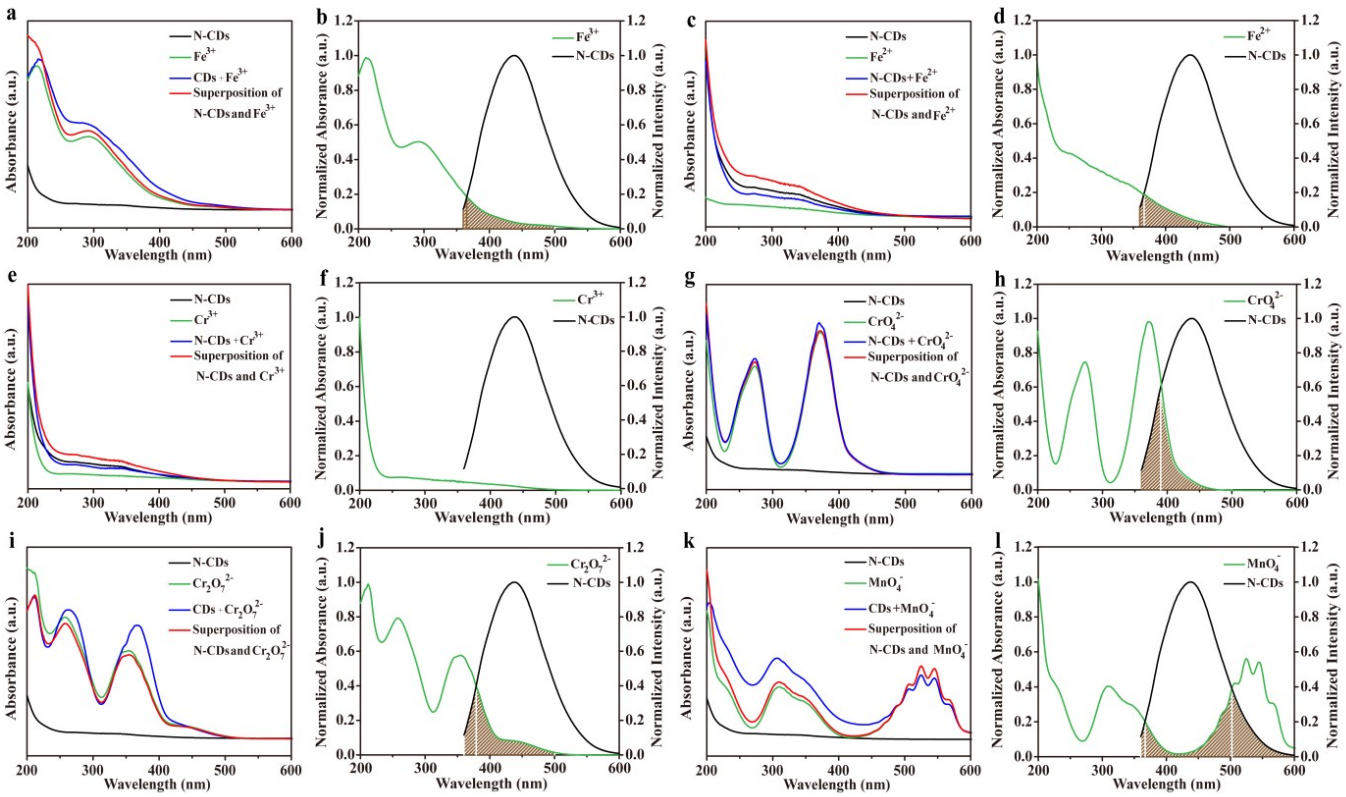

Fig. S3 UV-vis spectra of N-CDs before/after addition of Fe^{3+} (a, b), Fe^{2+} (c, d), Cr^{3+} (e, f), CrO_4^{2-} (g, h), $Cr_2O_7^{2-}$ (i, j) and MnO_4^- (k, l) and the spectra overlaps between N-CDs and various types of ions.

Table S4. Fluorescence recovery of "turn off-on" sensing system by different reductive agents

Reducing acid	F_R/F_F				Recovery rate（%）			
	Fe^{3+}	MnO_4^-	CrO_4^{2-}	$Cr_2O_7^{2-}$	Fe^{3+}	MnO_4^-	CrO_4^{2-}	$Cr_2O_7^{2-}$
Ti^{3+}	8.1	14.3	10.5	11.1	96.4	58.8	87.4	84.8
ascorbic acid	3.7	12.9	6.5	2.4	58.7	52.7	50.6	12.1
Sn^{4+}	2.6	3.6	3.5	1.3	22.3	11.8	23.4	2.6
hydroxylamine hydrochloride	1.4	1.6	1.6	0.6	6.3	3.0	5.6	-
GSH	1.1	7.1	1.3	0.4	2.1	26.7	3.3	-

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