Supporting Information

Near-Infrared Emission TMB Dots as Colorimetric and Fluorescent Nanoswitch for Reversible Recognition of Iron Ion and Cysteine and Its Logic Gate Application

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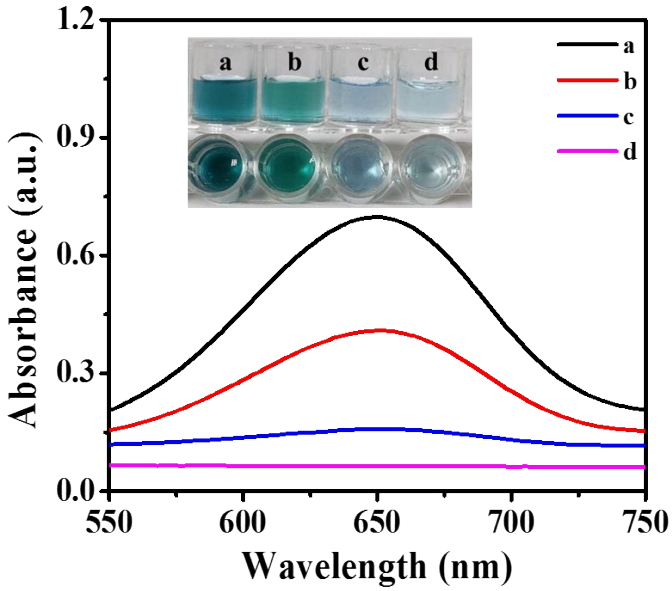

Fig. S1. UV-visible absorption spectra of TMBDs (a), TMB-HCl reacted at 200 °C (b), TMB (c) and TMB-HCl (d) in the presence of Fe^{3+} (200 μM) in tris-HCl buffer (pH=6). Inset: visual changes observed for a, b, c and d.

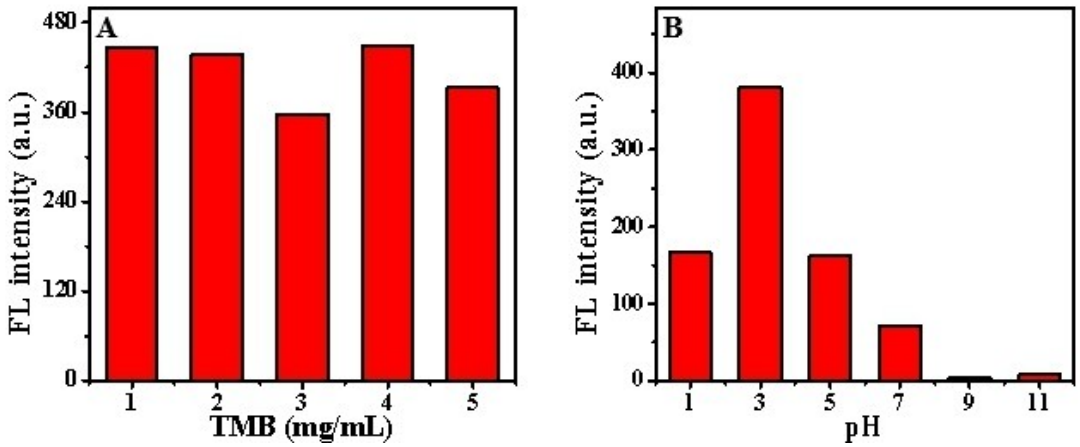

Fig. S2. (A) The fluorescence intensity of TMBDs synthesized by different concentration of initial TMB (pH=3). (B)The fluorescence intensity of TMBDs synthesized by different concentration of initial pH (quality of TMB is 40 mg.).

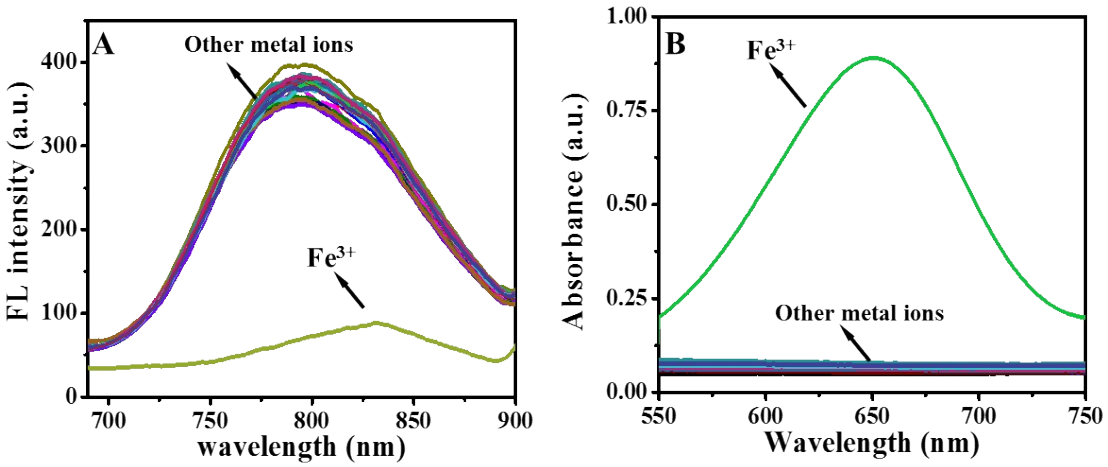

Fig. S3. (A)The fluorescence spectra of TMBDs towards metal ions in the Tris-HCl buffer (pH 6, 10 mM); (B) The absorbance spectra of TMBDs towards different metal ions in the Tris-HCl buffer (pH 6, 10 mM); the concentration of mental ions is 200 μM. (Other metal ions are Na^{+}, Ag^{+}, K^{+}, Ca^{2+}, Mg^{2+}, Ba^{2+}, Cd^{2+}, Co^{2+}, Cu^{2+}, Ni^{2+}, Hg^{2+}, Pd^{2+}, Cr^{3+}, Al^{3+} and Fe^{2+})

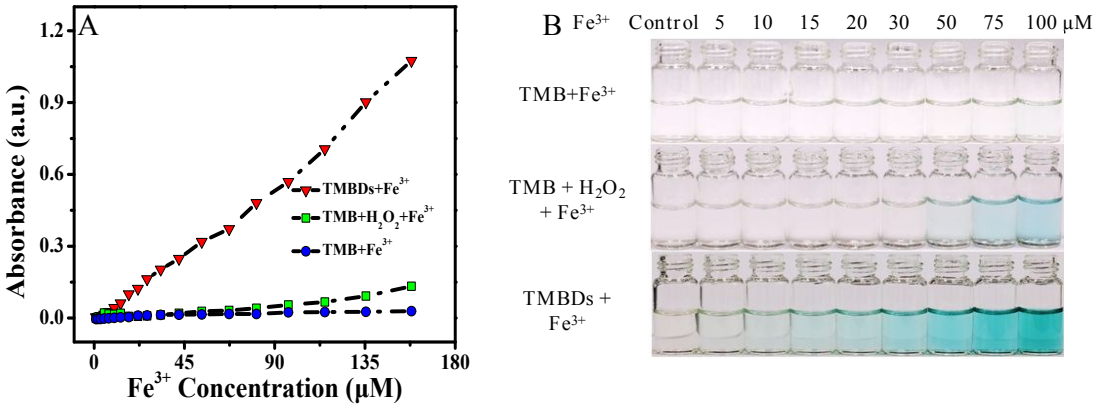

Fig. S4. (A) Absorbance intensity at 652 nm of TMB, TMB+H_2O_2 and TMBDs as a function of Fe^{3+} concentration; (B) Photographs of TMB+Fe^{3+}, TMB+H_2O_2 + Fe^{3+} and TMBDs + Fe^{3+} under visible light.

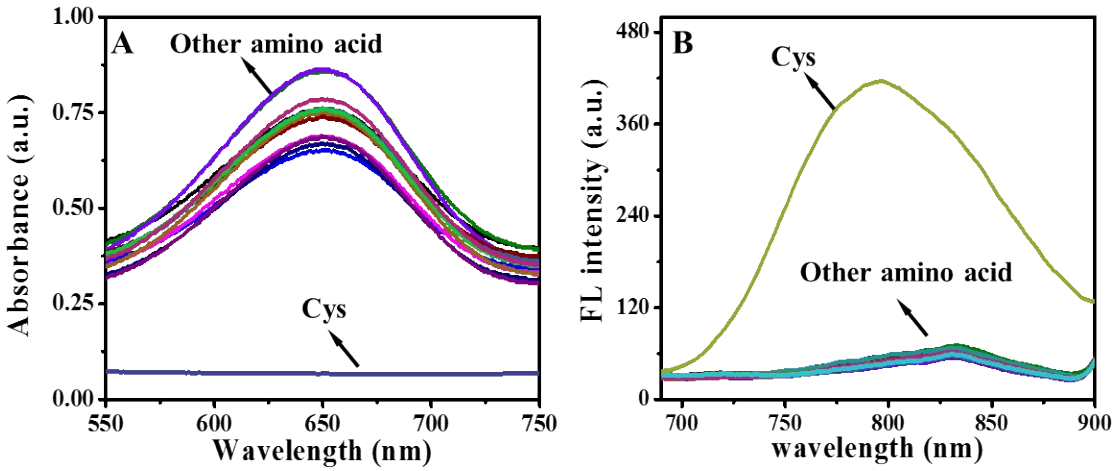

Fig. S5. (A)The absorbance of TMBDs towards to different amino acid in tris-HCl buffer (pH 6, 10 mM). (B) The fluorescence spectra of TMBDs towards different amino acids in tris-HCl buffer (pH 6, 10 mM. The concentration of amino acid is 100 μM. (Other amino acids are Val, Tyr, Met, Phe, His, Arg, Gly, Glu, Lys, Ser, Thr, Trp, Ile, Ala and Asp).

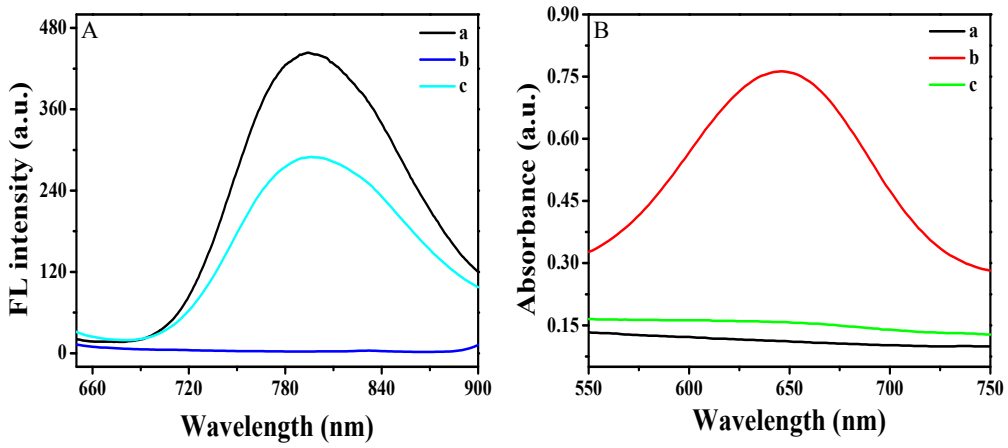

Fig S6. Fluorescence spectra (A) and absorbance spectra (B) of TMBDs at different conditions: (a) TMBDs; (b) TMBDs + 150 μM MnO_4^-; (c) TMBDs + 150 μM MnO_4^- + 150 μM AA.

Table S1 Comparison of some sensor platform for Fe^{3+} detection.

Material	Method	LOD (μM)	Liner range (μM)	Ref.
Triphenylamine	Fluorescence	0.107	0-150	40
Carbon dots	Fluorescence	0.727	0-50	41
CdTe QDs	Ratiometric	0.0205	0-4.5	42
DTC-PAS-Au NPs	Colorimetric	14.82	40-80	43
4-(4-hydroxy-1-naphthylazo)benzenesulfonic acid	Colorimetric	0.0042	0.0095-4	44
TMBDS	Fluorescence	7.5	30-150	this work
TMBDS	Colorimetric	0.17	20-120	this work

Table S2 Comparison of some sensor platform for Cys detection.

Material	Method	LOD (μM)	Liner range (μM)	Ref.
Hg_2L_2	Fluorescence	0.1	0.3-3	45
aN-dots	Fluorescence	5	0-30	46
Quinizarin	Fluorescence	0.158	0-30	47
Pyrimidine	Colorimetric	0.1	0-20	48
TMBDS	Fluorescence	1.5	0-75	this work
TMBDS	Colorimetric	0.1	0-12	this work

Table S3 Recovery study of spiked Fe^{3+} in 0.5% urine with designed nanoswitch (Abs).

Samples No	Fe^{3+} spiked (μM)	Fe^{3+} recovered (μM) mean[a] ± SD[b]	Recovery (%)
1	0	0.075±0.030	
2	30	30.644±0.698	102.2
3	50	50.091±1.195	97.7
4	100	100.181±1.652	95.9

Table S4. Recovery of spiked Fe^{3+} in 0.5% urine with designed nanoswitch (FL).

Samples No	Fe^{3+} spiked (μM)	Fe^{3+} recovered (μM) mean[a] ± SD[b]	Recovery (%)
1	0	7.296±3.699	
2	80	86.623±0.931	108.3
3	100	105.981±0.855	106.0
4	120	125.133±0.678	104.3

Table S5. Recovery study of spiked Cys in 0.5% urine with designed nanoswitch (Abs).

Samples No	Cys spiked (μM)	Cys recovered (μM) mean[a] ± SD[b]	Recovery (%)
1	0	0.293±0.106	
2	3	3.172±0.081	105.7
3	8	8.056±0.164	100.7
4	10	10.448±0.321	104.5

Table S6. Recovery study of spiked Cys in 0.5% urine with designed nanoswitch

(FL)

Samples No	Cys spiked (μM)	Cys recovered (μM) mean[a] ± SD[b]	Recovery (%)
1	0	0.364±0.304	
2	40	36.599±0.324	91.5
3	50	47.054±0.547	94.1
4	60	57.642±0.873	96.1