

Supporting Information

A fluorescent probe for sequential sensing of MnO_4^- and $\text{Cr}_2\text{O}_7^{2-}$ ions in aqueous medium based on UCNS/TMB nanosystem

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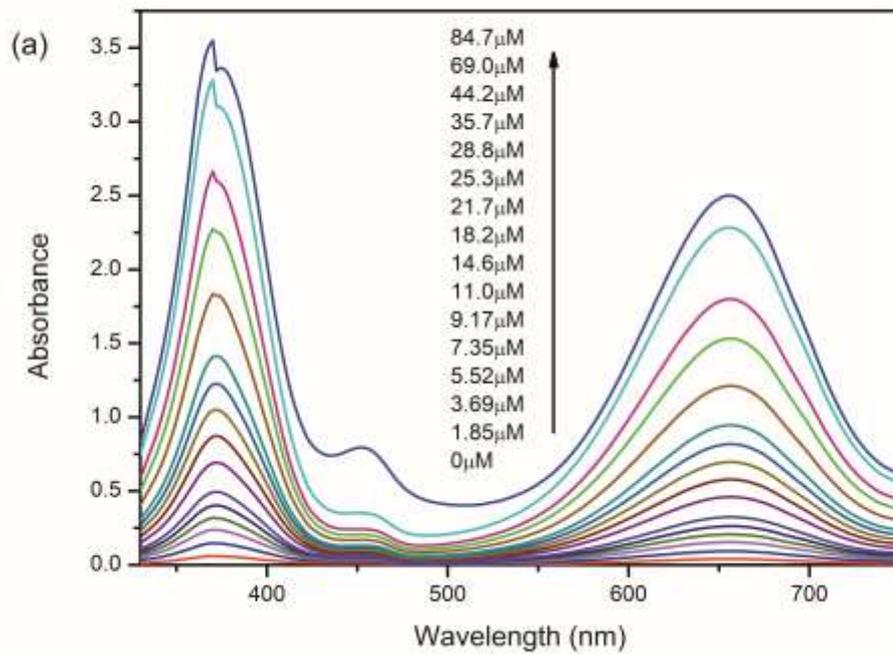


Fig. S1 Absorption spectra (a) and photographs (b) of UCNS-oxTMB nanosystem with addition of 0, 1.85, 3.69, 5.52, 7.35, 9.17, 11.0, 14.6, 18.2, 21.7, 25.3, 28.8, 35.7, 44.2, 69.0 and 84.7 μM of MnO_4^- ions..

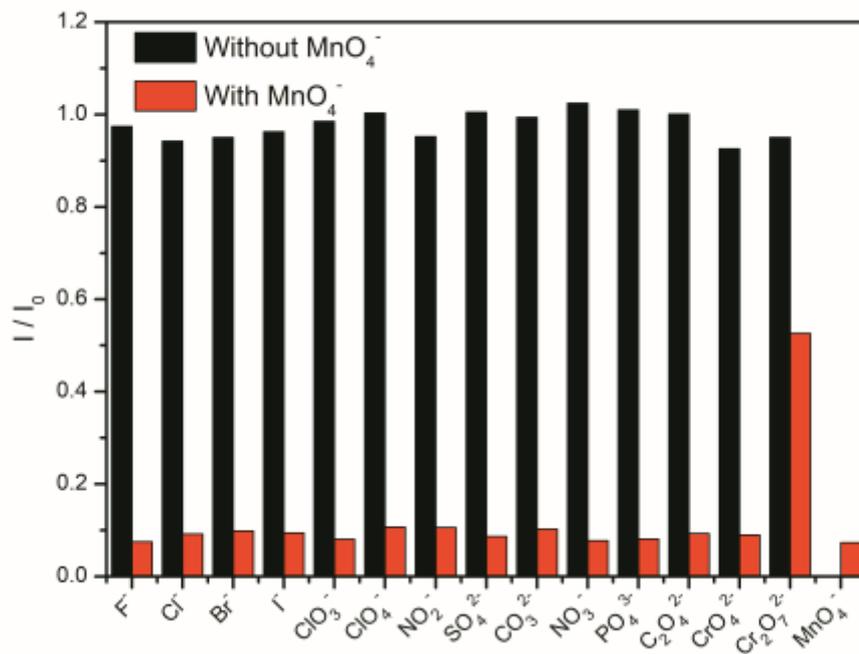


Fig. S3 Selectivity toward MnO_4^- without the presence of Pb^{2+} .

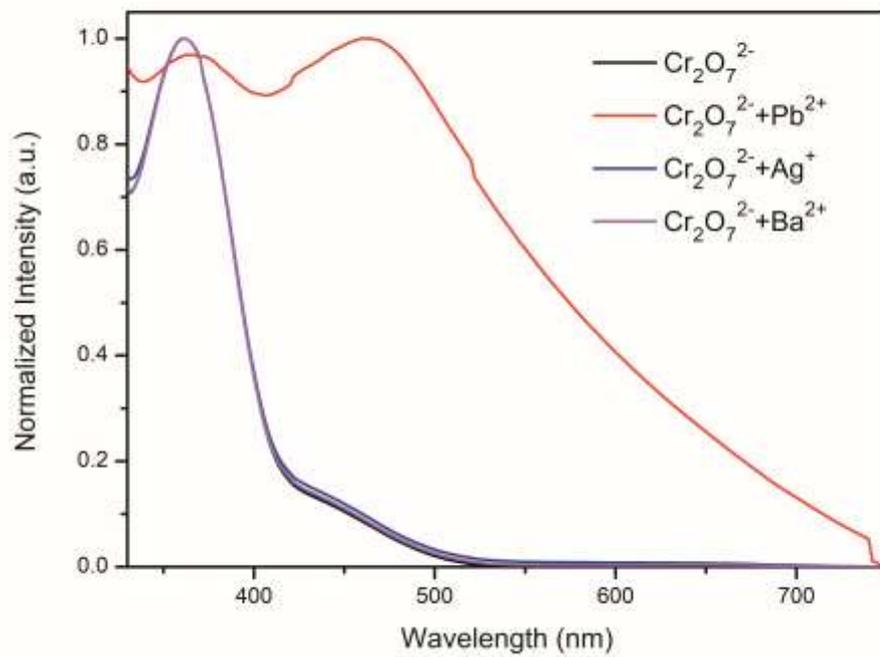


Fig. S4 The absorption spectra of Cr₂O₇²⁻ ions with various masking agents include Pb²⁺, Ag⁺ and Ba²⁺.

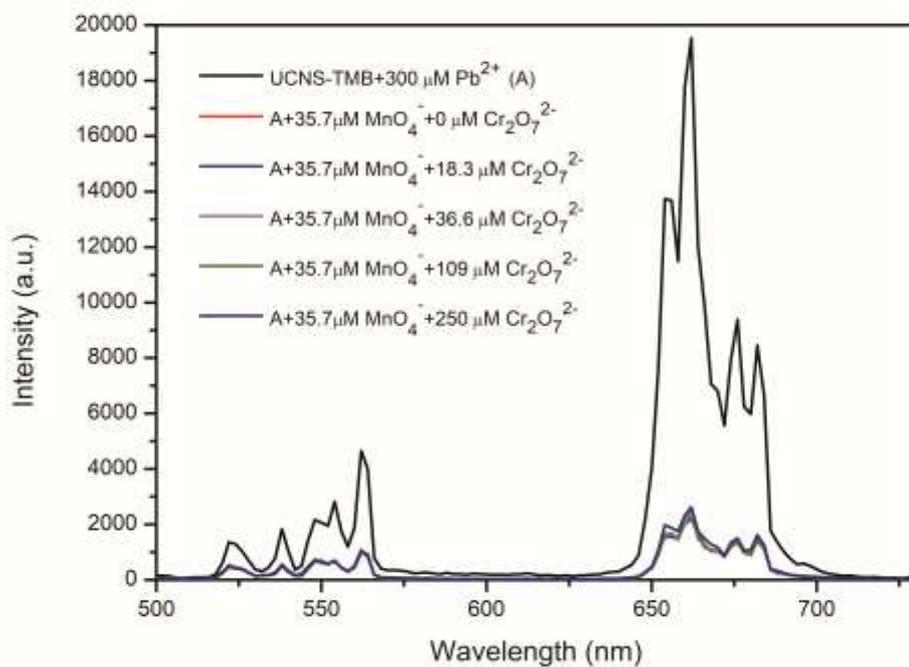


Fig. S5 The UCL spectra after different concentrations of $\text{Cr}_2\text{O}_7^{2-}$ ions added into MnO_4^- -sensing nanosystem.

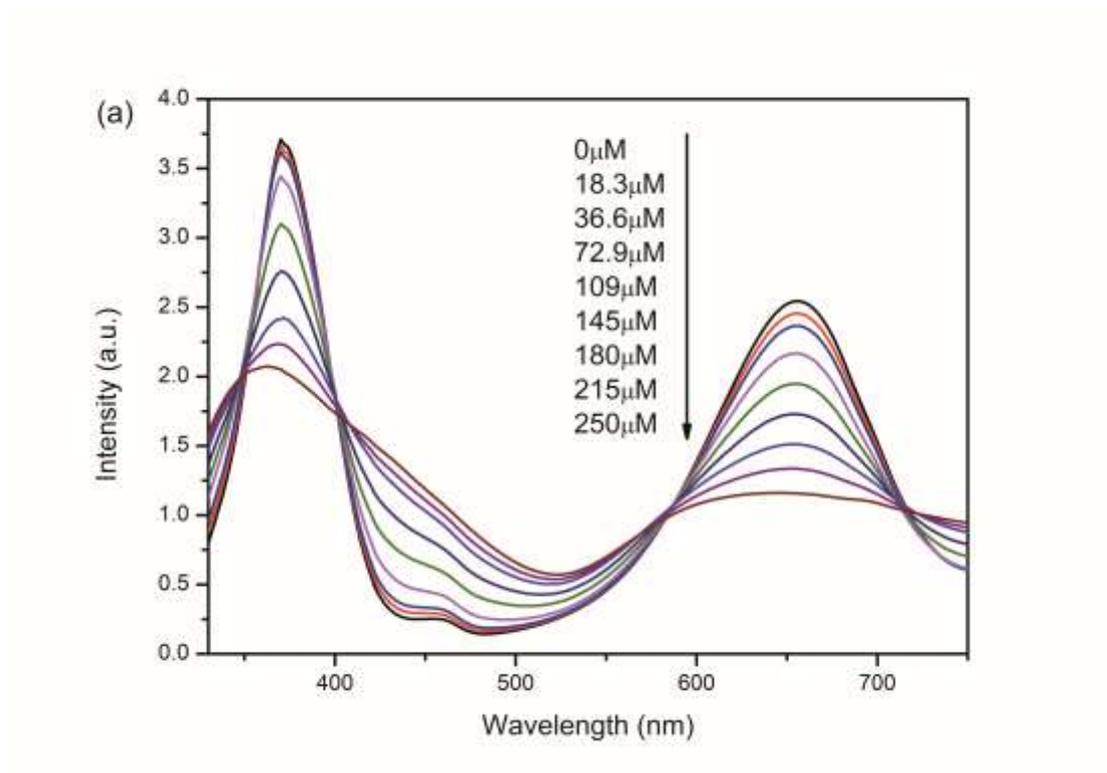


Fig. S6 Absorption spectra (a) and photographs (b) of UCNS-oxTMB nanosystem with addition of 0, 18.3, 36.6, 72.9, 109, 145, 180, 215 and 250 μM of $\text{Cr}_2\text{O}_7^{2-}$ ions, and last photograph was taken after standing for 1h.

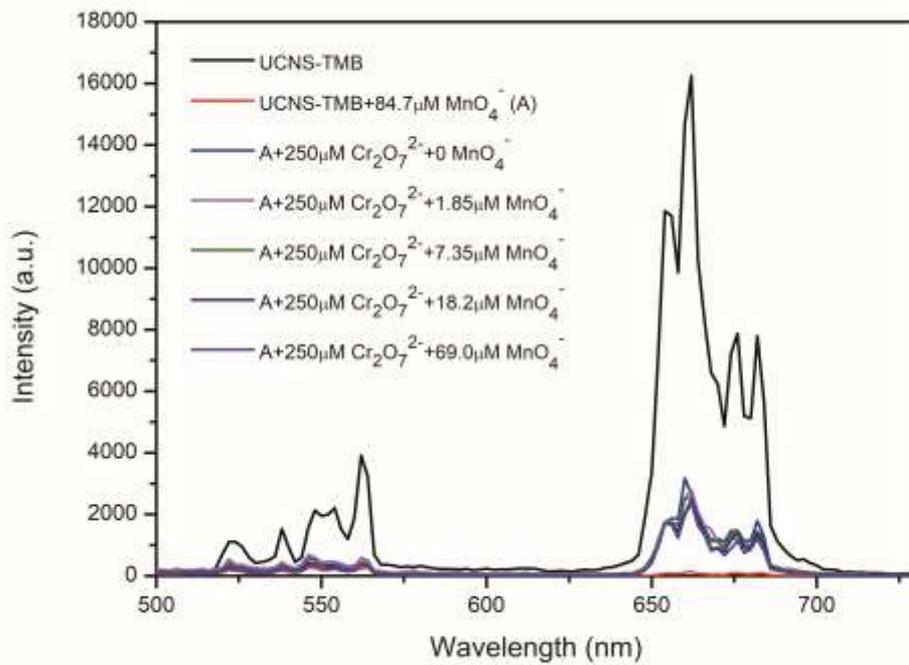


Fig. S8 The UCL spectra after different concentrations of MnO₄⁻ ions added into Cr₂O₇²⁻-sensing nanosystem.

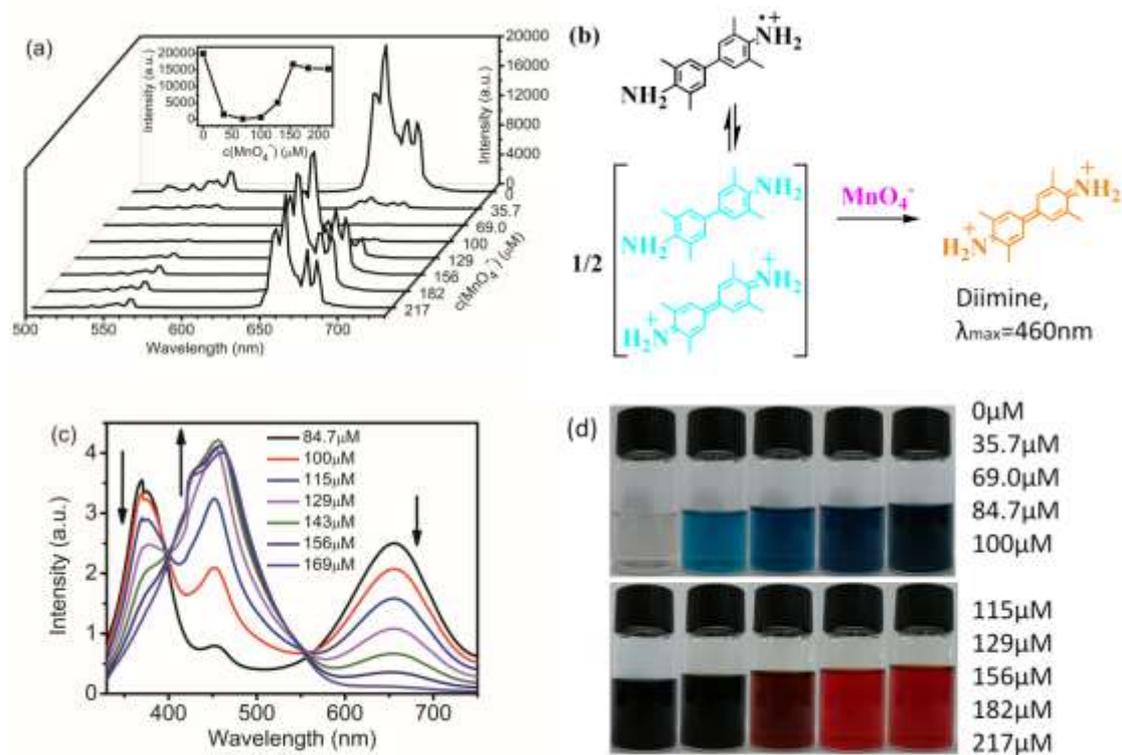


Fig. S9 (a) Fluorescence spectra of nanosystem with different concentrations of MnO_4^- under 980 nm excitation, inset shows the UCL intensity change at 662nm. (b) Mechanism of oxTMB oxidation. (c) The absorption spectra of oxTMB with the addition of different concentrations of MnO_4^- . (d) photographs of UCNS-oxTMB nanosystem with addition of different concentration of MnO_4^- ions.

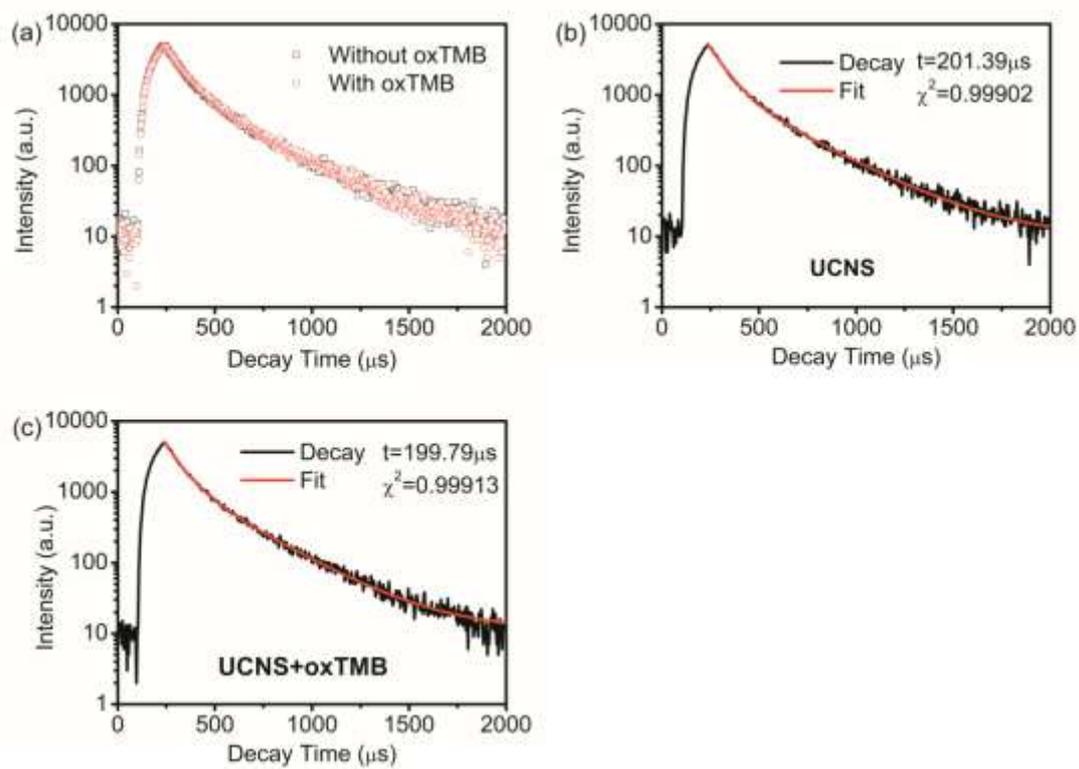


Fig. S10 The UC fluorescence lifetimes of UCNS in the absence (black line) and presence (red line) of 0.5 mM oxTMB (a). The exponential fitting of the lifetimes of UCNS in the absence (b) and presence (c) of oxTMB.

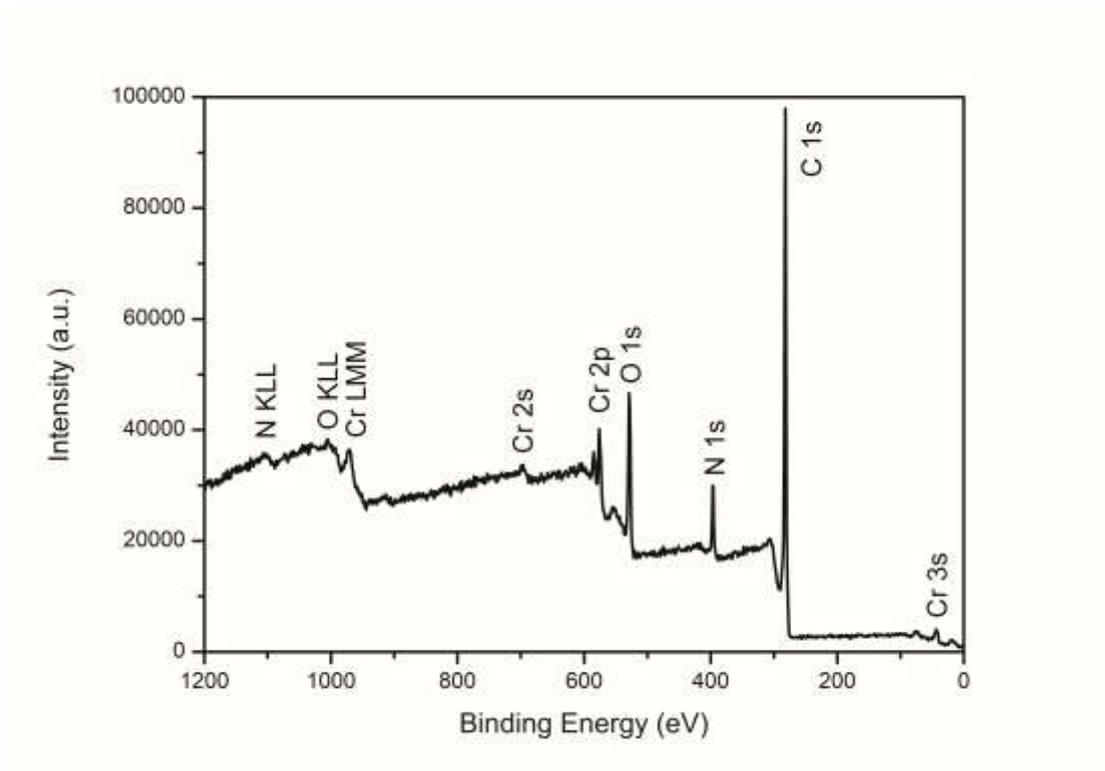


Fig. S11 XPS spectra of 2oxTMB-Cr₂O₇ complex.

Table. S1 ICP and elemental analyze (EA) results of 2oxTMB-Cr2O7 complex.

Elements	Theoretical mass content of TMB-Cr ₂ O ₇ (%)	Theoretical mass content of 2TMB-Cr ₂ O ₇ (%)	Actual mass content in xTMB-Cr ₂ O ₇ sample (%)	Calculated x value
Cr from ICP	22.89	15.01	16.77 ± 0.0583	1.8883
C from EA	44.30	55.49	51.51 ± 0.0515	1.8491
H from EA	3.99	5.24	5.11 ± 0.00511	1.948
N from EA	6.17	8.09	7.39 ± 0.00739	1.8177