Electronic Supplementary Information

A dual-signal optical sensing platform of CDs-MnO_2 NS composites for facile detection of ascorbic acid based on a combination of Tyndall effect scattering and fluorescence

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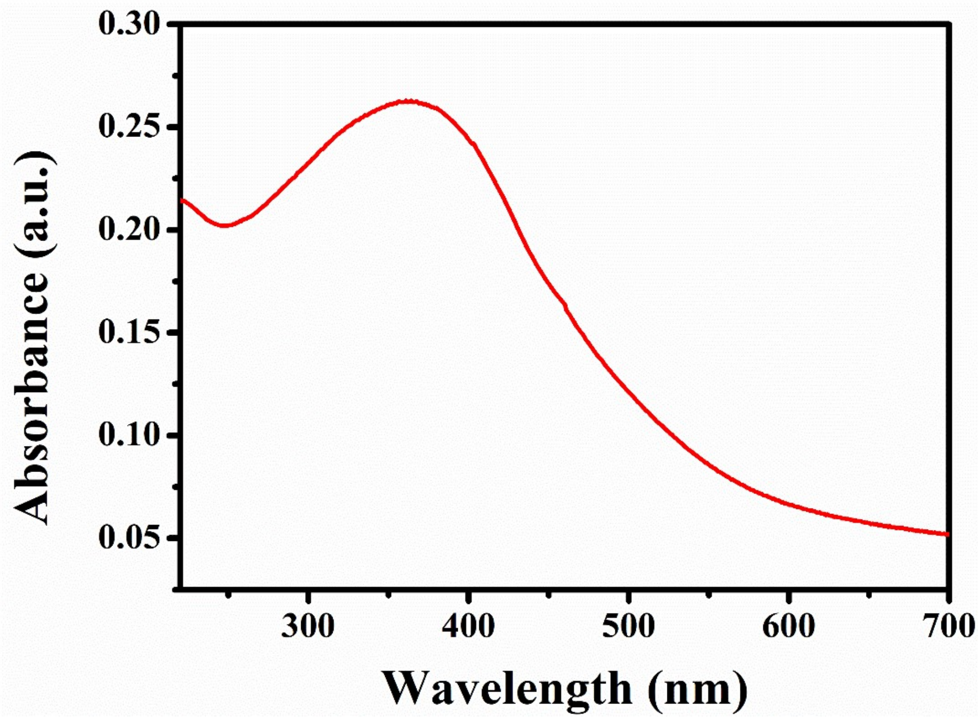

3 **Fig. S1** UV-Vis absorption spectra of MnO_2 NSs.

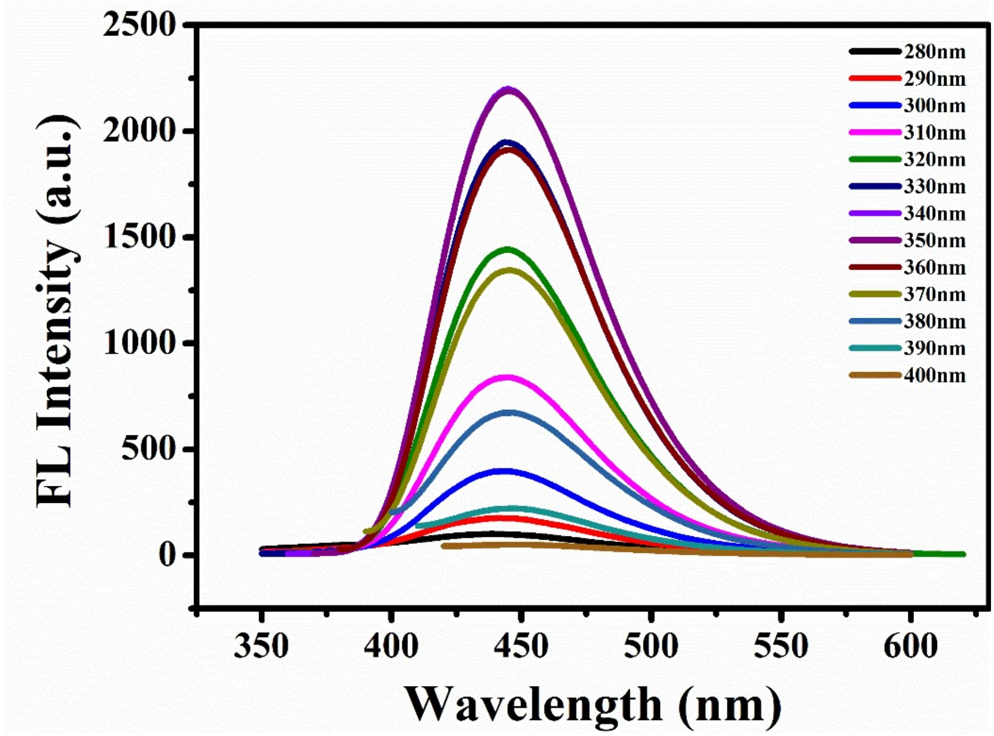

Fig. S2 Fluorescence emission spectra of CDs at different excitation wavelengths.

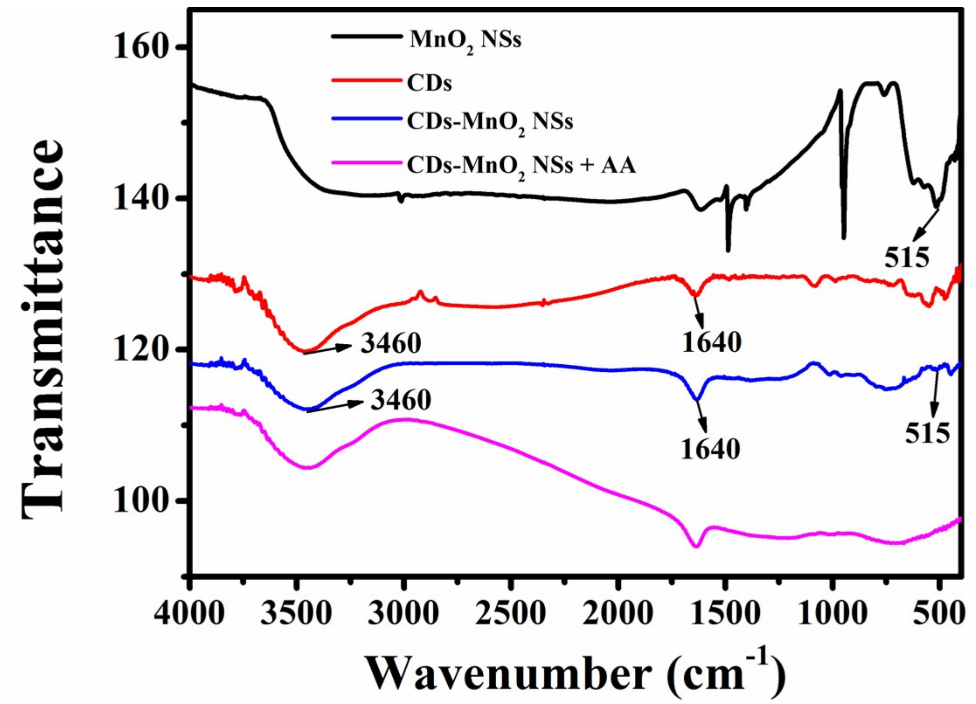

Fig. S3 FT-IR spectra of the MnO_2 NSs, CDs, CDs-MnO_2 NS and CDs-MnO_2 NS + AA.

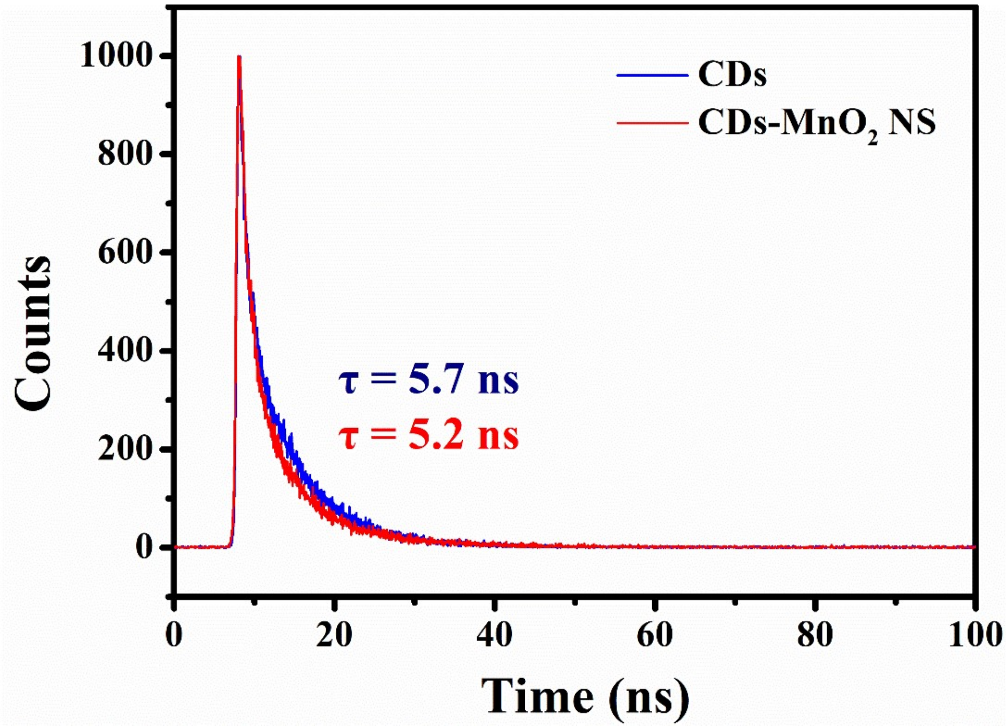

Fig. S4 Fluorescence lifetime of CDs and CDs-MnO_2 NS.

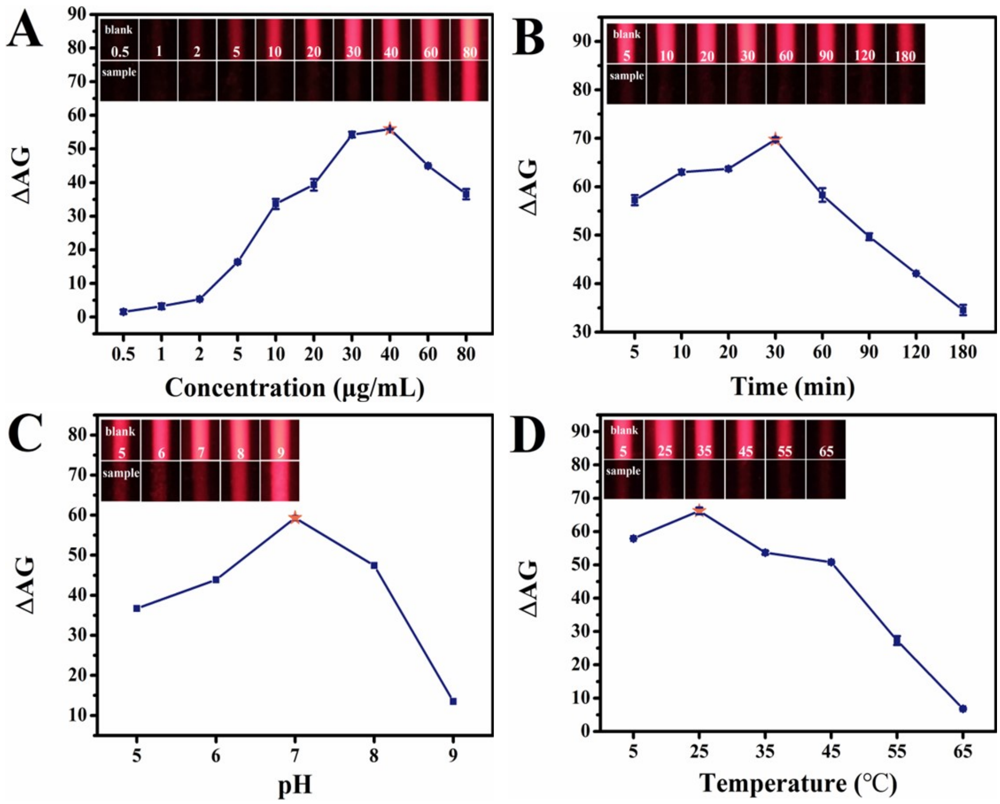

Fig. S5 Optimizing conditions for detecting AA. The effects of MnO_2 NSs concentrations (A), reaction time (B), pH (C) and temperatures (D) on TE of the dual-signal optical sensing platform in the presence of 80 μM AA.

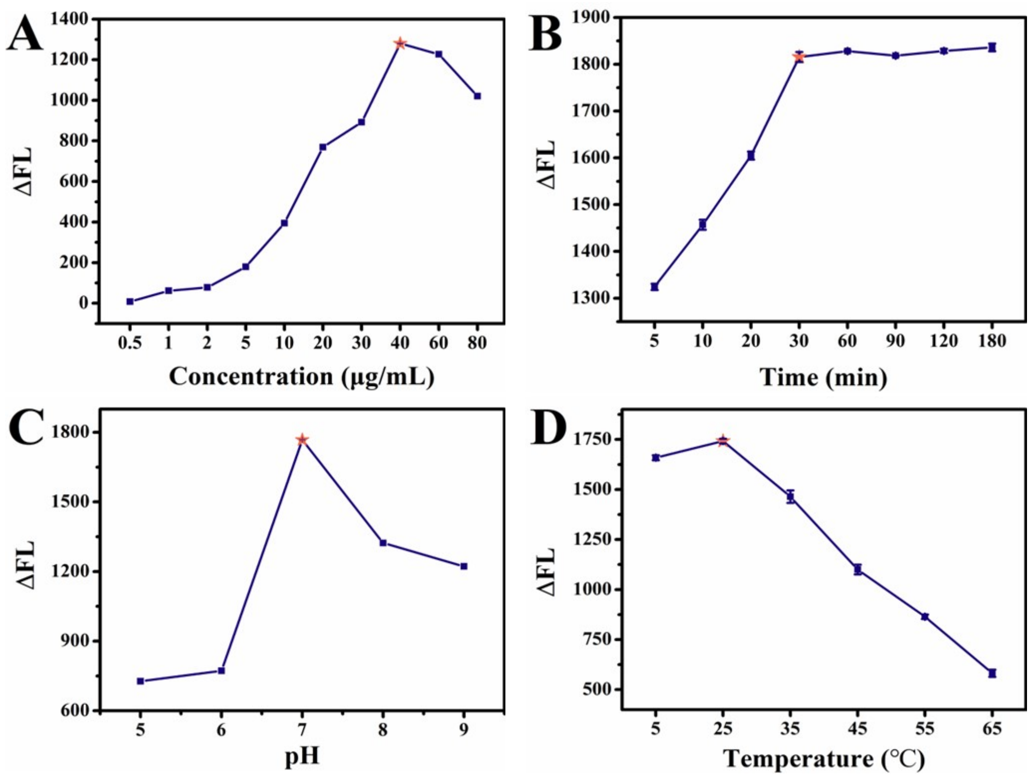

Fig. S6 Optimizing conditions for detecting AA. The effects of MnO_2 NSs concentrations (A), reaction time (B), pH (C) and temperatures (D) on fluorescence of the dual-signal optical sensing platform in the presence of 80 μM AA.

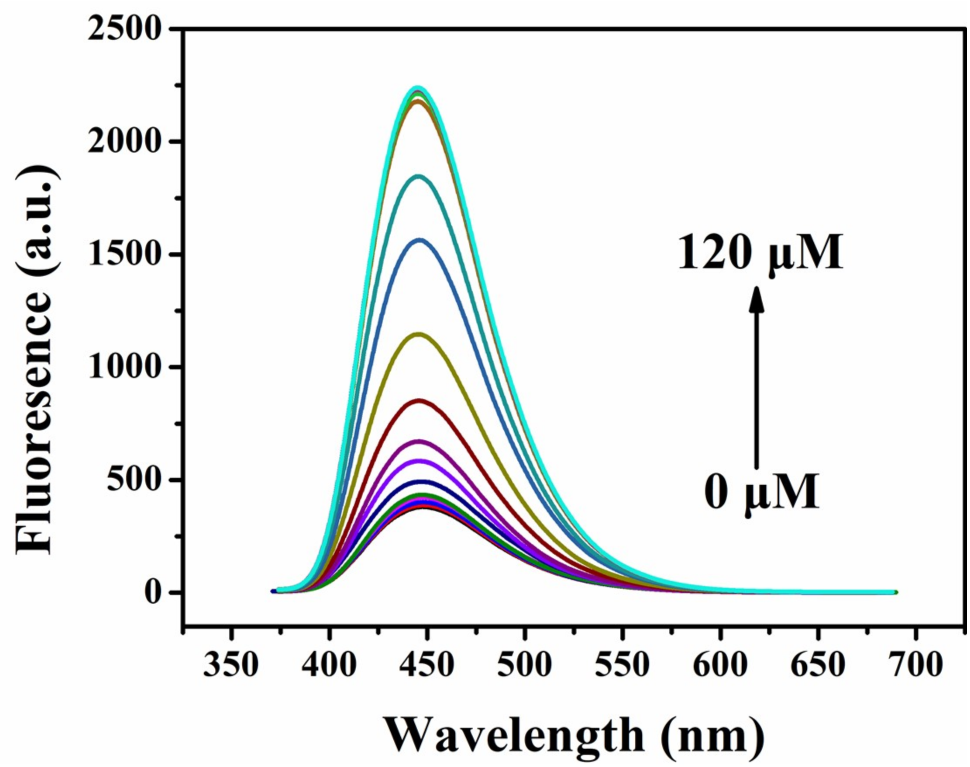

Fig. S7 Fluorescence curves of CDs-MnO_2 NS incubated with different concentration of AA (0.02, 0.05, 0.2, 0.6, 0.8, 1, 5, 2, 5, 8, 10, 20, 25, 40, 50, 80, 100 and 120 μM).

Table S1 Comparison of AA detection between this work and reported methods.

materials	method	linear range	LOD	ref
hCNTs-4ABA/Au-IDA	Electrochemistry	50-600 µM	0.65 µM	Llobregat et al., 2018[S1].
3DGF/CuO	Electrochemistry	0.43-200 mM	0.43 mM	Ma et al., 2014[S2].
$FeVO_4$	Electrochemistry	0.1-0.3 mM	0.38 µM	Anwar et al., 2014[S3].
Pt-HMCN	Colorimetry	6-60 µM	3.29 µM	Chen et al., 2020[S4].
Au/Cu NRs	Colorimetry	0-2 mM	25 µM	Xu et al., 2019[S5].
Sc-MOF	Colorimetry	0.2-20 µM	0.174 µM	Su et al., 2019[S6].
graphene oxide/$HAuCl_4$	Smartphone	20-375 µM	1.04 µM	Ji et al., 2018[S7].
N-CD	Smartphone	150-550 µM	59.83 µM	Kayani et al., 2024[S8].
$Fe_{1-x}S$	Smartphone	10-500 µM	0.93 µM	Cao et al., 2024[S9].
RhB@$DiCH_3$MOF-5	Fluorometry	1-25 µM	0.31 µM	Guo et al., 2019[S10].
AuNCs-PbS-QDs	Fluorometry	3-40 µM	1.5 µM	Zhao et al., 2015[S11].
Eu MOF	Fluorometry	0-3.0 µM	0.32 µM	Dong et al., 2015[S12].
N/S-GQDs/$KMnO_4$	Fluorometry and Colorimetry	0.01-225 µM and 0.1-30 µM	0.008 µM and 0.11 µM	Bezuneh et al., 2018[S13].
BNS-CDs@Fe^{3+}	Fluorometry and Colorimetry	0.1-600 µM and 1-110 µM	0.05 µM and 0.3 µM	Liu et al., 2018[S14].
CDs-MnO_2 NS	Smartphone and Fluorometry	0.4-100 µM and 0.02-50 µM	0.113 µM and 0.003 µM	This Work

References

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