Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

Enhanced detection of ascorbic acid with cascaded fluorescence recovery of dual-nanoquenchers system

Zhi-Ang Liu [a], Ya-Nan Zuo [c], Yinghui Xia [c], Jing Sun [b], Shuyun Zhu [c]*

[a] TEM Laboratory, Experimental Teaching and Equipment Management Center, Qufu Normal University, Qufu City, 273165, Shandong, China.

[b] Qinghai Key Laboratory of Qinghai-Tibet Plateau Biological Resources, Northwest Institute of Plateau Biology, Chinese Academy of Sciences, Xining City, 810001, Qinghai, China.

[c] School of Chemistry and Chemical Engineering, Qufu Normal University, Qufu City, 273165, Shandong, China.

* Corresponding author: E-mail: shuyunzhu1981@163.com (S. Zhu).

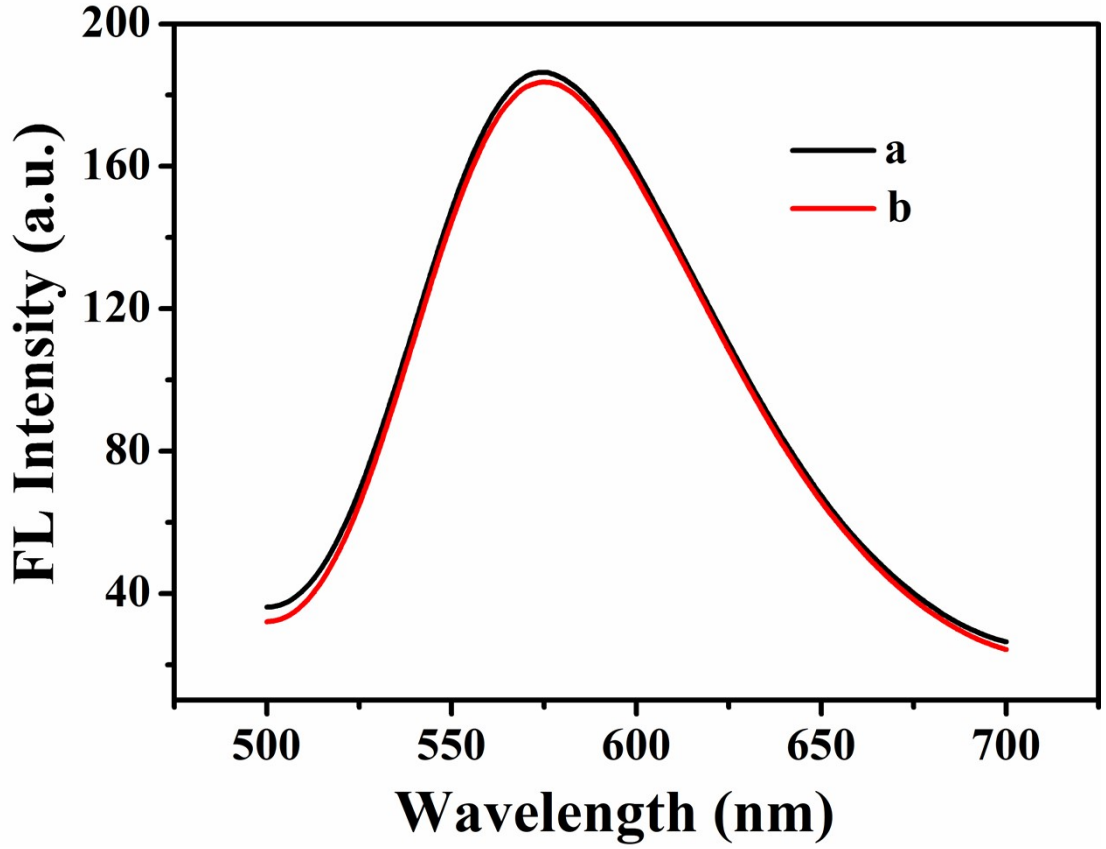

Fig. S1 Fluorescence emission spectra of DAP-AuNPs system in the absence (a) and presence (b) of AA.

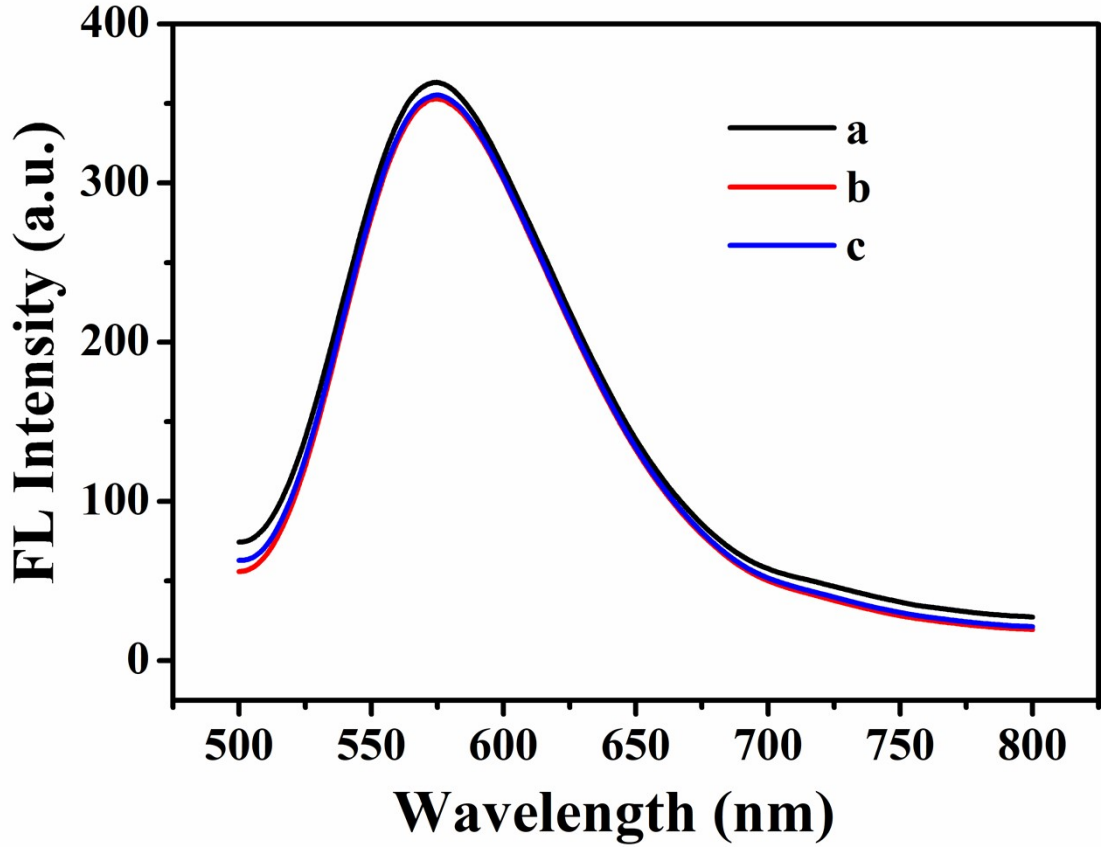

Fig. S2 Fluorescence emission spectra of DAP in the absence (a) and presence of AA (b) and Mn^{2+} (c).

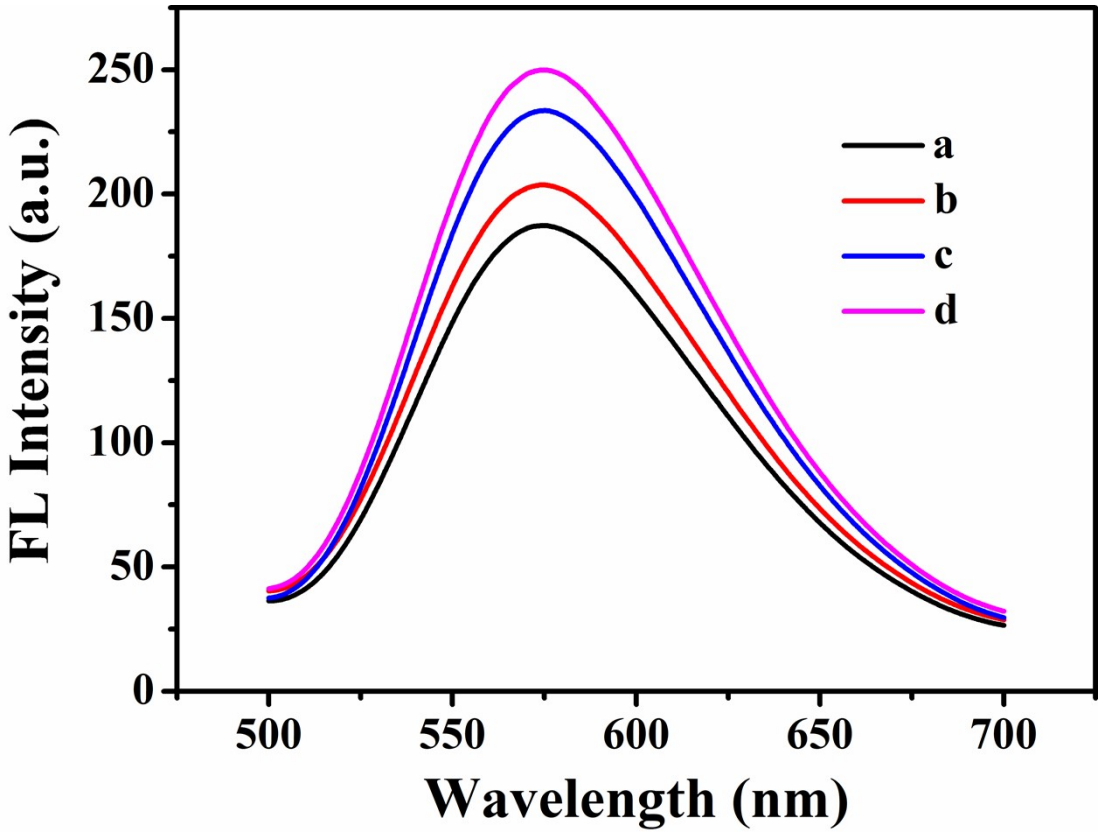

Fig. S3 The fluorescence emission spectra of DAP-AuNPs system in presence of Mn^{2+} with different concentrations. (a) 0, (b) 40, (c) 100, (d) 500 μM.

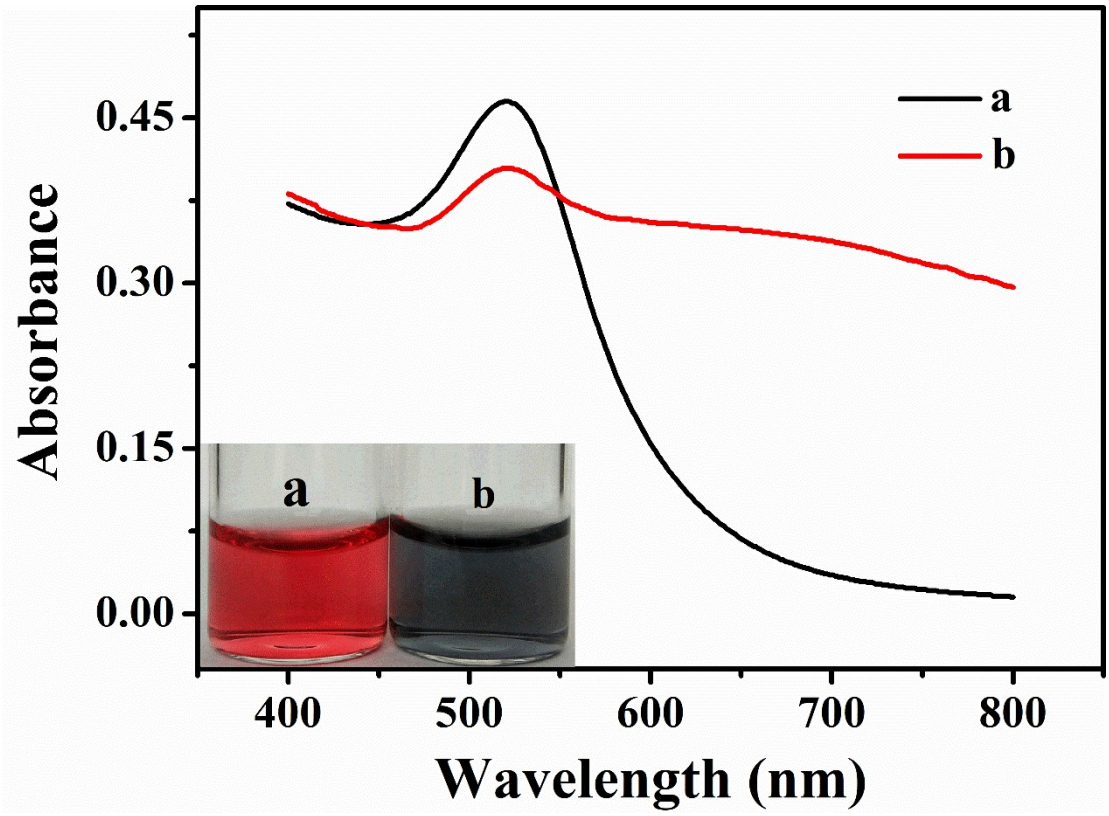

Fig. S4 The UV-vis spectra of AuNPs in the absence (a) and presence of 20 μM Mn^{2+} (b). Inset: Corresponding digital photos.

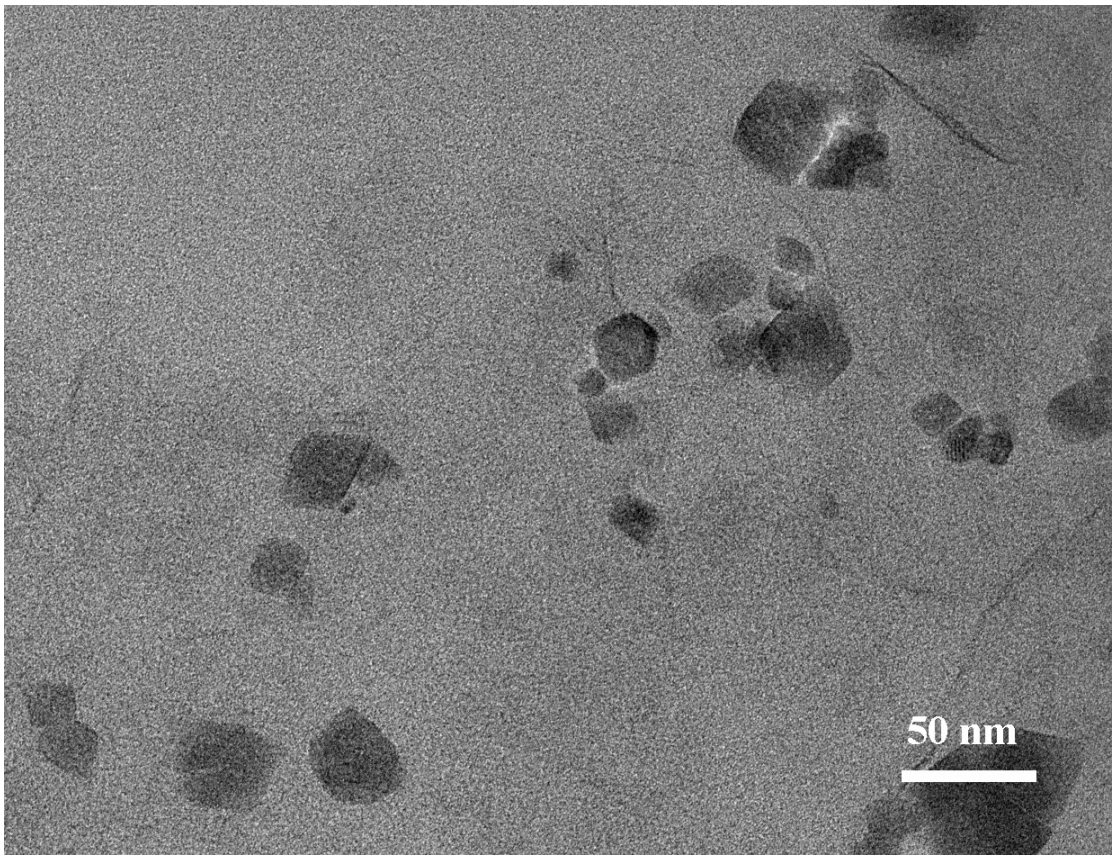

Fig. S5 TEM image of MnO_2 nanosheets in the presence of AA.

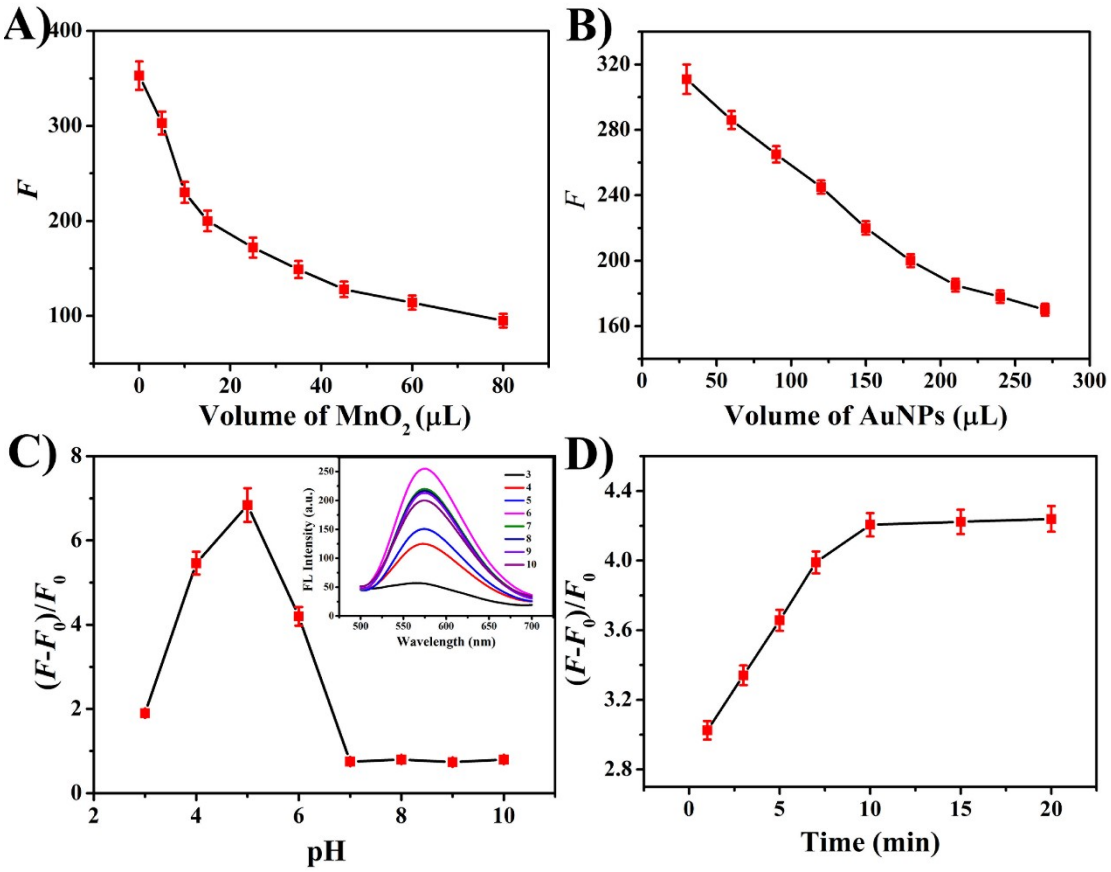

Fig. S6 The effects of MnO_2 volumes **(A)** and AuNPs amounts **(B)** on the fluorescence intensities of DAP. The effects of pH **(C)** and reaction time of AA with MnO_2 **(D)** on the $(F\text{-}F_0)/F_0$ of DAP-MnO_2-AuNPs system, where F and F_0 is the fluorescence of the DAP-MnO_2-AuNPs system with and without AA, respectively. Inset of Fig. S5C: The corresponding fluorescence emissive spectra of DAP under different pH.

Table S1 Comparison of the analytical performances of two approaches.

	Linear range/μM	LOD/μM	Sensitivity (μM^{-1})
DAP-MnO_2	0.5-50	0.17	0.0119
DAP-MnO_2-AuNPs	0.02-1	0.0067	0.835
	1-50		0.0434

Table S2 Recovery test of AA in commercial fruit juices.

Juice samples	Present method (mg/100 mL)	Initial amount (mg/100 mL)	Added (μM)	Founded (μM)	Recovery (%)
Orange juice	28.9	30	2	1.91	95.5
			15	14.2	94.7
			35	36.5	104.2
Pineapple juice	29.1	30	2	1.95	97.5
			15	14.4	96
			35	33.2	94.9
Grape juice	18.5	20	2	1.92	96.0
			15	15.8	105.3
			35	36.8	105.1

Table S3 Recovery test of AA in fresh fruit samples.

Fruit samples	Present method (mg/100 g)	Reference method (mg/100 g)	Added (μM)	Founded (μM)	Recovery (%)
Pear	4.92	5.13	5	4.76	95.2
			20	21.1	105.5
Grape	6.32	6.54	5	4.79	95.8
			20	19.4	97
Orange	32.21	34.53	5	4.86	97.2
			20	20.8	104
Kiwi	37.63	36.91	5	4.84	96.8
			20	19.1	95.5