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Electronic Supplementary Information

A bi-mode RRS and colorimetric alkaline phosphatase assay based on in situ ascorbic acid-induced signal generation from manganese dioxide nanosheets†

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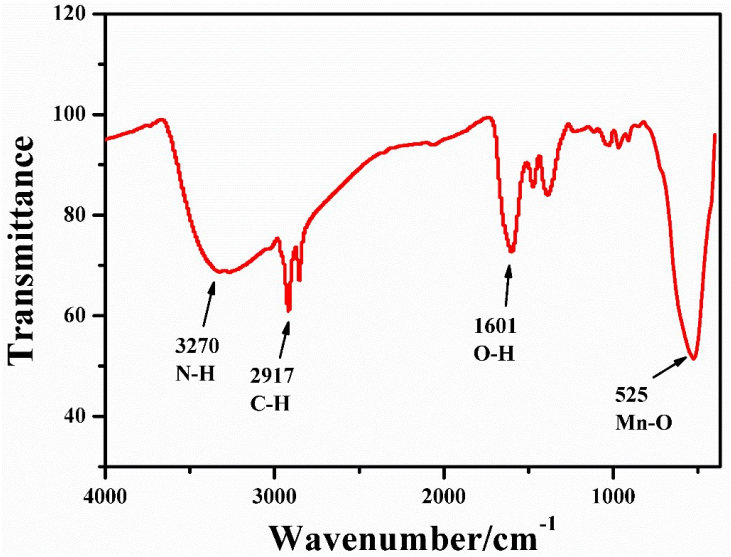

Fig. S1 FT-IR spectrum of the MnO_2 nanosheets.

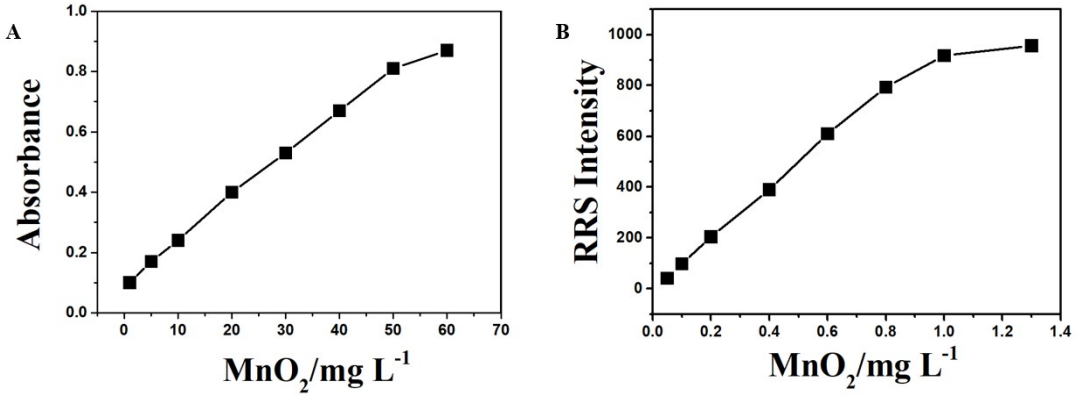

Fig. S2 Absorbance and RRS Intensity of MnO_2 nanosheets exhibited concentration dependence. (In our inspection system).

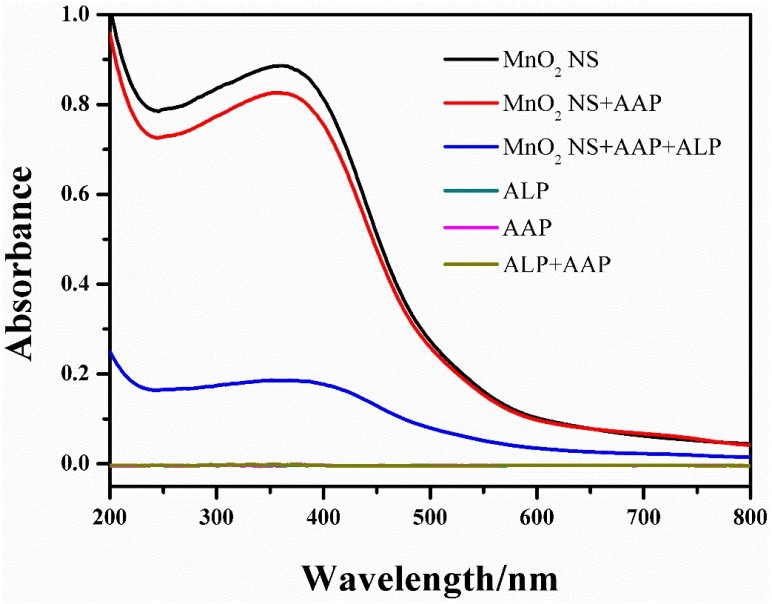

Fig. S3 UV-vis absorption spectra of MnO_2 nanosheets (50 mg L^{-1}); MnO_2 (50mg L^{-1}) + AAP (2 mmol L^{-1}); MnO_2 (50 mg) + AAP (2 mmol L^{-1}) + ALP (200 U L^{-1}); ALP; AAP; and AAP + ALP.

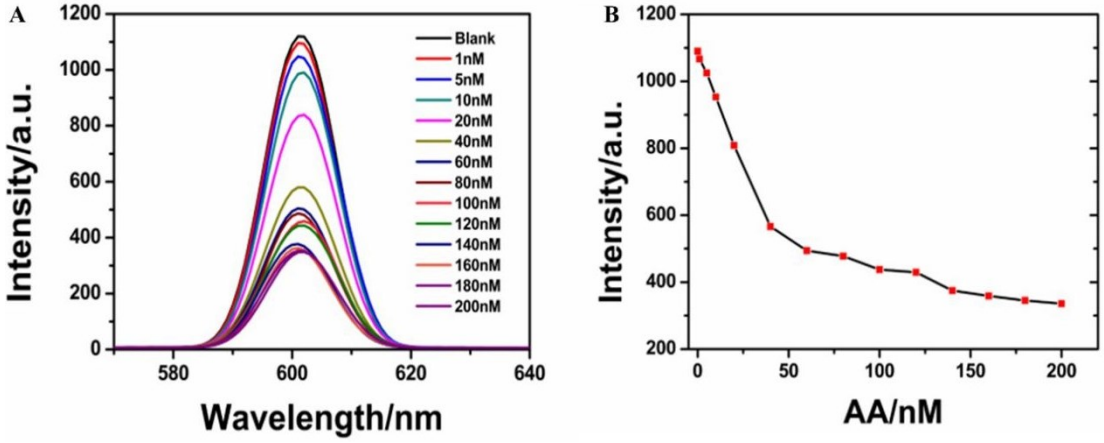

Fig. S4 (A) RRS spectra of MnO_2 nanosheets with different concentration of AA (0, 1.0, 5.0, 10.0, 20.0, 40.0, 60.0, 80.0, 100.0, 120.0, 140.0, 160.0, 180.0 and 200 nmol L^{-1}). The excitation wavelength was 600 nm. (B) The linear relationship of RRS intensity vs the level of AA. Reaction system: MnO_2 nanosheets,1 mg L^{-1}; 10 mmol L^{-1} Phosphate buffer (pH,7.4).

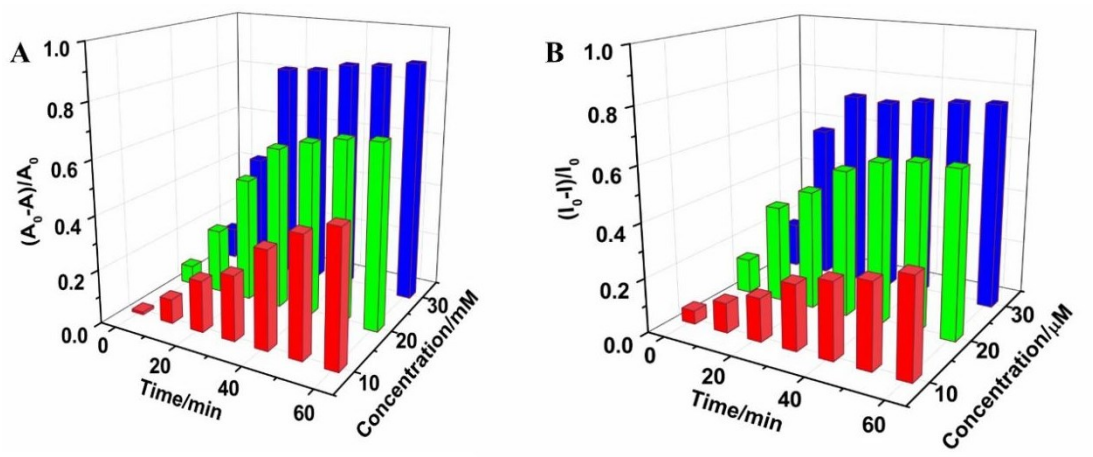

Fig. S5 Ratio of $(A_0-A)/A_0$ (A) and $(I_0-I)/I_0$ (B) as a function of incubation time and AAP concentration. Reaction system A: 50 mg L^{-1} MnO_2 nanosheets and 200 U L^{-1} ALP; 10 mmol L^{-1} Phosphate buffer (pH, 7.4). Reaction system B: 1 mg L^{-1} MnO_2 nanosheets and 200 mU L^{-1} ALP; 10 mmol L^{-1} Phosphate buffer (pH, 7.4).

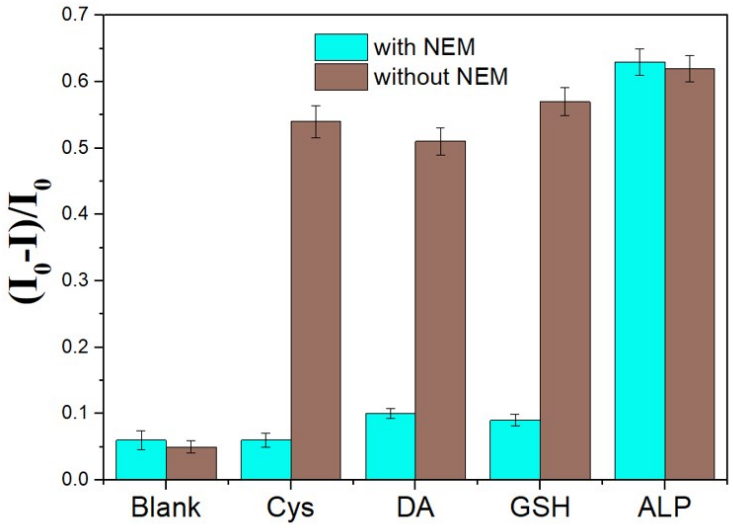

Fig. S6 Ratio of $(I_0-I)/I_0$ responses of different reducing substances on the selective detection of ALP activity. as a function of incubation time and AAP concentration. Reaction system: 100 μmol L-1 of Cys, 100 μmol L-1 of GSH or 100 pmol L-1 DA; 10 mg L-1 NEM; 1 mg L-1 MnO2 nanosheets and 200 mU L-1 ALP; 10 mmol L-1 Phosphate buffer (pH, 7.4).

Table S1. Comparison of analytical performances for ALP assay via different methods.

Method	Linear range	LOD	Reference
Colorimetric (MVCV)	0.5-25 U L^{-1}	0.1 U L^{-1}	41
Colorimetric (PDA liposomes)	0-100 U L^{-1}	5.4 U L^{-1}	42
Fluorescence (Naphthalimide)	0-200 U L^{-1}	0.25 U L^{-1}	43
Fluorescence (Carbon dots)	2-100 U L^{-1}	0.55 U L^{-1}	44
Electrochemical (CdS@GR-CoOOH)	10-300 U L^{-1}	1.5 U L^{-1}	45
Electrochemical (TNA/QD PEC)	0.2-15 U L-1	0.15 U L^{-1}	46
Colorimetric (MnO_2 nanosheets)	0.5-30.0；30.0-140.0 U L^{-1}	0.16 U L^{-1}	This work
RRS (MnO_2 nanosheets)	0.5-150 mU L^{-1}	0.17 mU L^{-1}	This work