Electronic Supplementary Material (ESI) for

A label-free "turn-on" fluorescence platform of glucose based on AuNCs@MnO_2 nanocomposites

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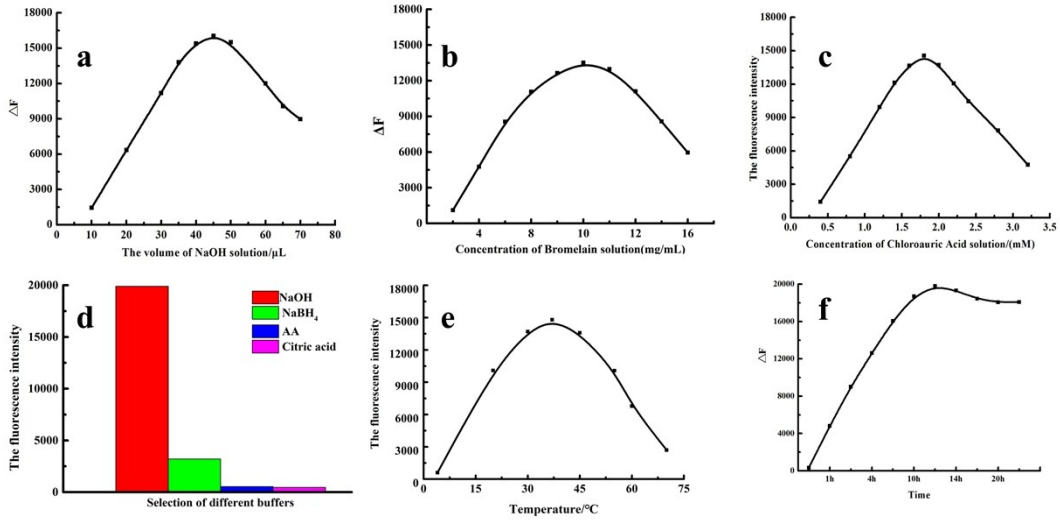

Fig. S1 Optimization of synthesis conditions of bromelain gold nanoclusters:(a)Selection of NaOH solution dosage;(b)Selection of concentration of bromelain solution;(c)Effect of concentration of chloroauric acid solution;(d)Effects of different reagents on the fluorescence intensity of the system: NaOH, $NaBH_4$, ascorbic acid (AA), citric acid;(e)Selection of different reaction temperatures;(f)Fluorescence intensity changes under different reaction times.The experimental conditions of the final system :C_{NaOH}=45μL(1 mol/L); $C_{Bromelain}$= 25mg/mL,pH=9.0); $C_{Chloroauric\ acid}$=10mmol/L;Temperature=37℃;Time=12h.

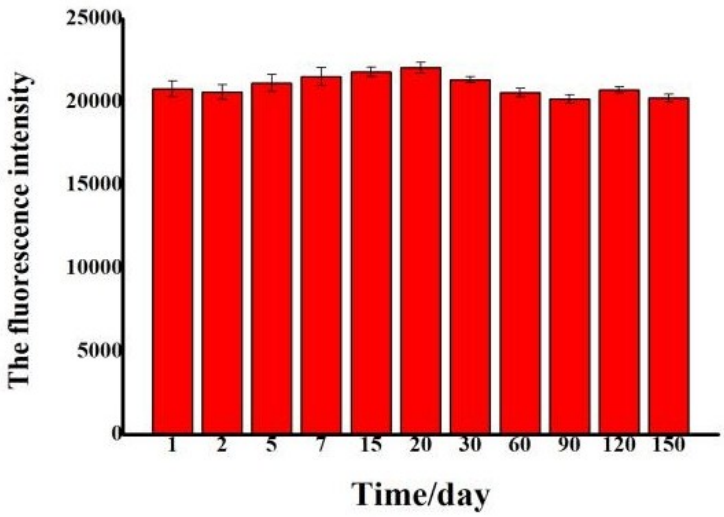

Fig.S2 Fluorescence stability of Bromelain-AuNCs in five months. AuNCs were stored in 4℃ in dark.

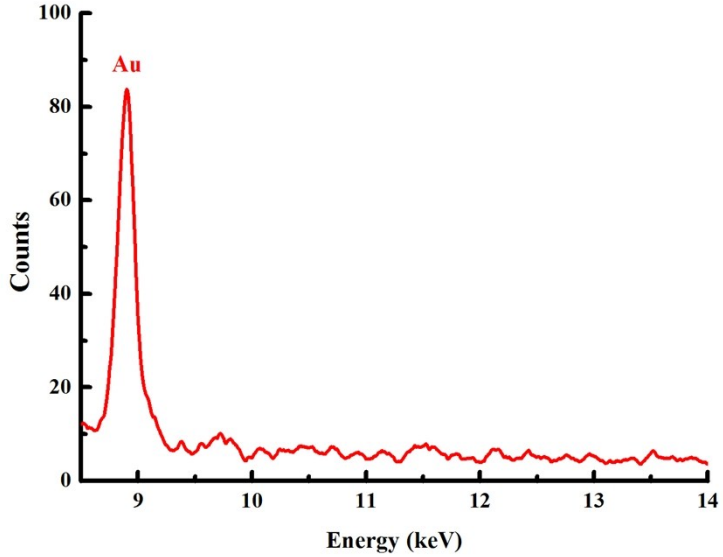

Fig. S3 The EDX pattern of synthesized of AuNCs

MnO_2 (10^{-4} mg/mL)	A_{ex390}	A_{em680}	CF= F_{corr}/F_{obsd}	T=298K, F_{obsd}	T=303K, F_{obsd}	T=310K, F_{obsd}	T=298K, F_{corr}	T=303K, F_{corr}	T=310K, F_{corr}
0	0.014	0.003	1.02	10009.04	9066.23	8806.08	10180.00	9221.09	8956.50
0.1	0.041	0.012	1.06	9397.785	8736.88	8346.43	9949.21	9249.52	8836.16
0.25	0.068	0.027	1.11	8931.41	8456.665	7822.24	9900.34	9374.09	8670.84
0.4	0.091	0.034	1.15	8021.175	8069.285	7340.335	9188.97	9244.09	8409.01
0.5	0.102	0.041	1.17	7808.595	7627.25	7140.175	9121.11	8909.29	8340.34
0.75	0.212	0.123	1.43	6294.08	6312.3	5893.08	9015.47	9041.57	8441.09
1	0.298	0.162	1.63	4701.065	5028.31	4389.295	7666.70	8200.39	7158.25

Table 1 summarizes the concentrations of MnO_2 nanosheets and the absorbance and fluorescence intensity of AuNCs after the addition of MnO_2 nanosheets. Correction factors (CFs) for the IFE at different concentrations of MnO_2 nanosheets were also calculated.

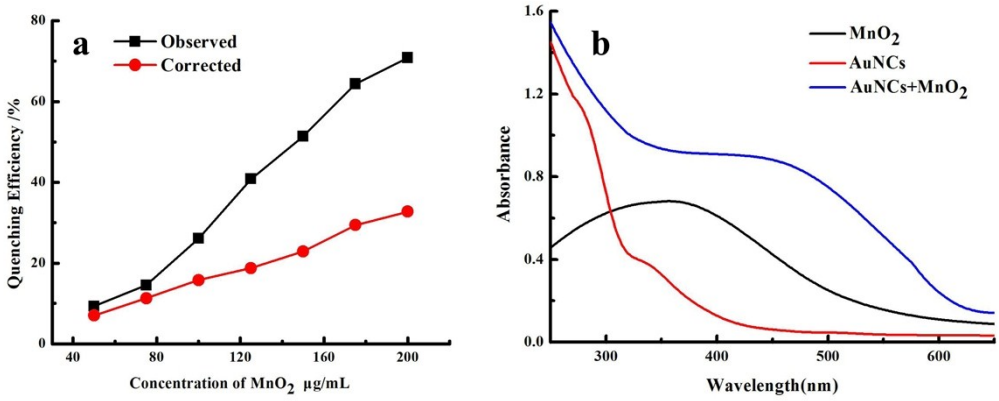

Fig.S4 (a): Suppressed efficiency (E%) of observed (black curve) and corrected (red curve) measurements for AuNCs after each addition of different concentrations of MnO_2 nanosheets; (b): The UV−vis absorption spectrum of MnO_2 nanosheets（black curve）,AuNCs (red curve)，AuNCs+MnO_2 (blue curve).

Table 2：Interaction constants of MnO_2 and AuNCs at different temperatures

T	K_{sv}（$mL\cdot g^{-1}$）	$K_q(mL\cdot(g\cdot s)^{-1})$	$k(mL\cdot g^{-1})$	R(stern-Volmer)
298K	3.89×10^{5}	3.89×10^{13}	3.89×10^{5}	0.9973
303K	3.57×10^{5}	3.57×10^{13}	3.57×10^{5}	0.9977
310K	1.81×10^{5}	1.81×10^{13}	1.81×10^{5}	0.9944

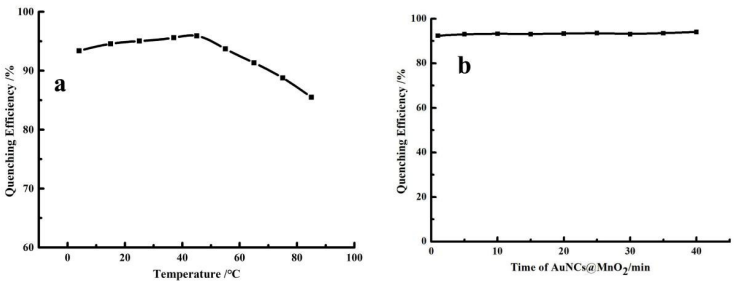

Fig.S5 (a)the formation time of AuNCs@MnO_2 nanocomposite;(b)the temperature selection of AuNCs@MnO_2 nanocomposite

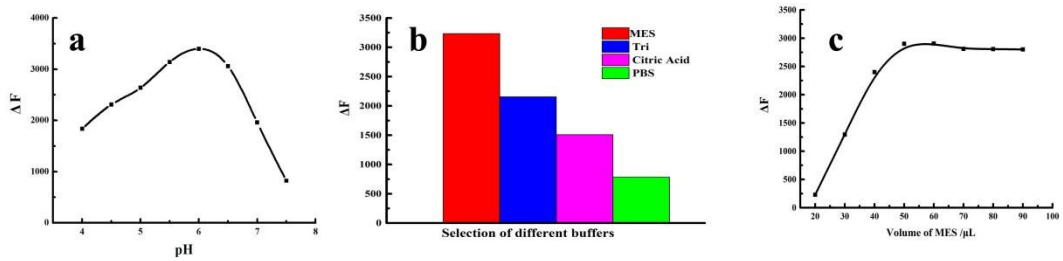

Fig.S6 The selection of in the AuNCs@MnO_2-H_2O_2 system (a) pH;(b)different butters;(c)Volume of MES buffer.

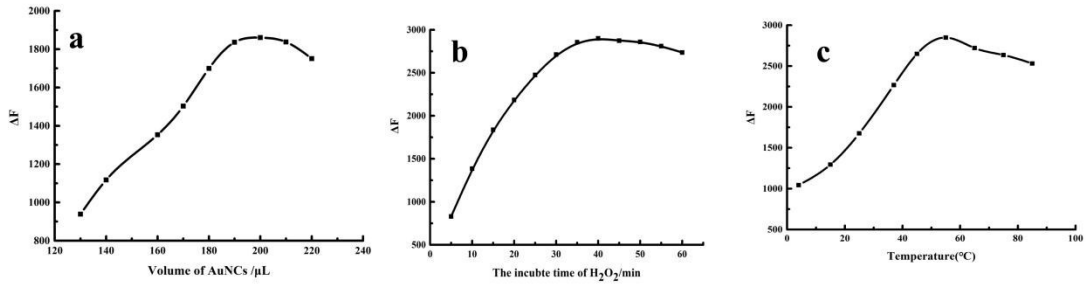

Fig. S7 The Effect of in the AuNCs@MnO_2-H_2O_2 system (a)Volume of AuNCs;(b)the incubation time with H_2O_2;(c)the temperature

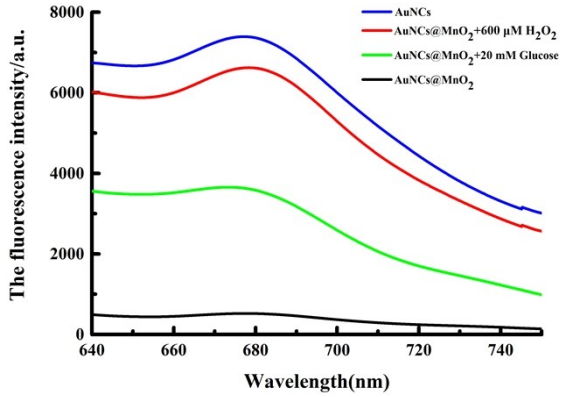

Fig.S8 Fluorescence emission spectra of AuNCs(blue line);AuNCs@MnO_2 (black line) ;AuNCs@MnO_2+600nM H_2O_2;AuNCs@MnO_2+20mM Glucose.

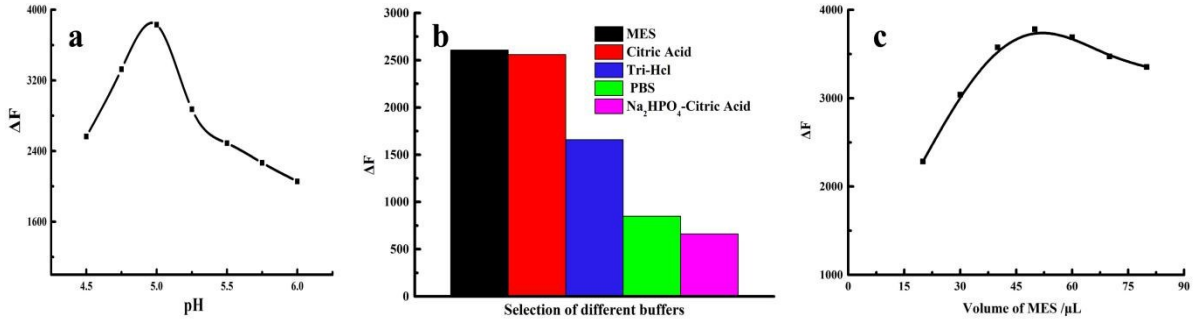

Fig.S9 The selection of in the AuNCs@MnO_2-glucose system (a) pH;(b)different butters;(c)Volume of MES buffer.

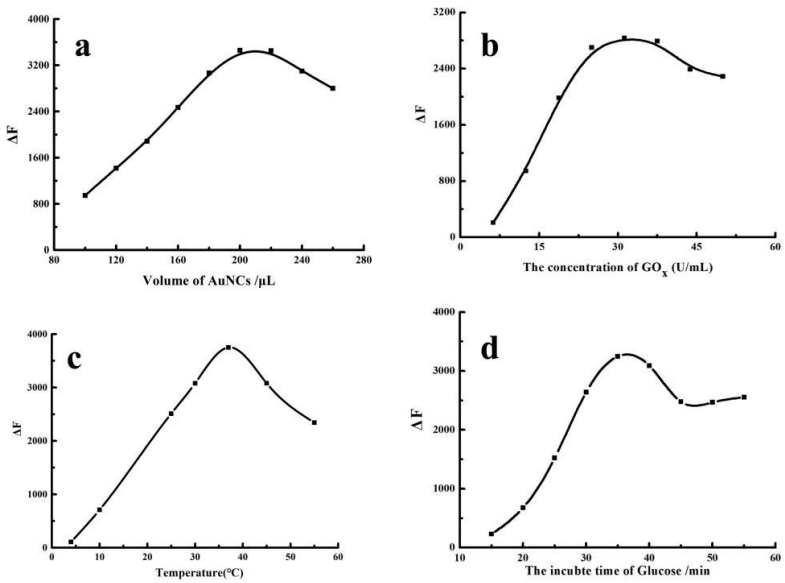

Fig.S10 The Effect of in the AuNCs@MnO_2-glucose system:
(a) Volume of AuNCs;(b)ncubation time of GO_x enzyme;
(b) the incubation time;(c)the incubation time with glucose;(d)the temperature

Table 3. Comparison of the proposed H_2O_2 detection method with different reporting methods.

Methods	System	Detection limits
Fluorescence[1]	H_2-TEHPPS	13μM
Colorimetric[2]	Modified NiO nanoparticles	8μM
Colorimetric[3]	Cu-SBA-15	3.7μM
Colorimetric[4]	V_2O_5 nanozymes	1μM
Colorimetric[5]	Ag nanoparticles	200nM
Colorimetric[6]	PtCNPs-TMB	150nM
Colorimetric[7]	GQDs/AgNPs	30nM
Electrochemical[8]	FePc-CP NSs film modified electrode	17nM
Fluorescence (This work)	AuNCs@MnO_2 nanocomposite	5.7nM

Table 4. Comparison of the proposed glucose detection method with different reporting methods.

Methods	System	Detection limits
Microfluidic[9]	microfluidic paper-based analysis devices (μPADs)	21.3mM
Colorimetric[10]	Au nanorods@Pt nanodots core/shell nanostructures	450μM
Surface-enhanced Raman Spectroscopy [11]	MBA–Ag@AuNPs–GO	330μM
Fluorescence[12]	Modified CdTe/ZnTe/ZnS Quantum Dots	300μM
Colorimetric[2]	Modified NiO nanoparticles	200μM
Surface Plasmon Resonance Spectroscopy. [13]	Molecular imprinting/ Hydrogel /Au NPs	111.1μM
Electrochemical[14]	Pt/Au/BDD electrode	77μM
Fluorescence[15]	polyethyleneimine (PEI)-capped copper nanoclusters	8μM
Fluorescence (This work)	AuNCs@MnO_2 nanocomposite	6.7μM

Table 5. Comparison of the proposed glucose detection method with different reporting methods.

Methods	System	Linear range
Fluorescence [16]	UCNP-MnO_2	0−400 μM
Fluorescence[17]	phenol formaldehyde resin (PFR)-MnO_2	5 μM - 1 mM
Fluorescence[18]	CuNCs-MnO_2	1 μM - 200 μM
Fluorescence (This work)	AuNCs@MnO_2 nanocomposite	25μM-30mM

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