Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

Gold nanoclusters encapsulated into zinc-glutamate metal organic frameworks for efficient detection of H_2O_2

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Instruments

Transmission electron microscopy (TEM) images were obtained on a JEOL-1230 (JEOL) transmission electron microscope operating at 100 kV. High-resolution TEM (HRTEM) images were obtained via a JEOL-1230 transmission electron microscope equipped with energy dispersive X-ray spectrometer (EDX) analyses at 100 kV. The crystalline phases of AuNCs@ZnGlu-MOF were characterized using a Rigaku 2500 (Japan) X-ray diffractometer (XRD). X-ray photoelectron spectrum (XPS) was performed on K-Alpha 1063 (Thermo Fisher Scientific). The Zeta potential measurement was performed by the Nano-ZS Zetzsozer ZEN3600 (Malvern Instruments Ltd., UK). Fourier transform infrared (FT-IR) spectra were obtained on an FT-IR spectrophotometer (Nicolet Instrument Co., USA). Fluorescence spectra were carried out on F-7000 fluorescence spectrophotometer (Hitachi, Japan). Steady-state luminescence lifetime measurements were performed using an Edinburgh FLS 980 Lifetime and Steady-State spectrometer.

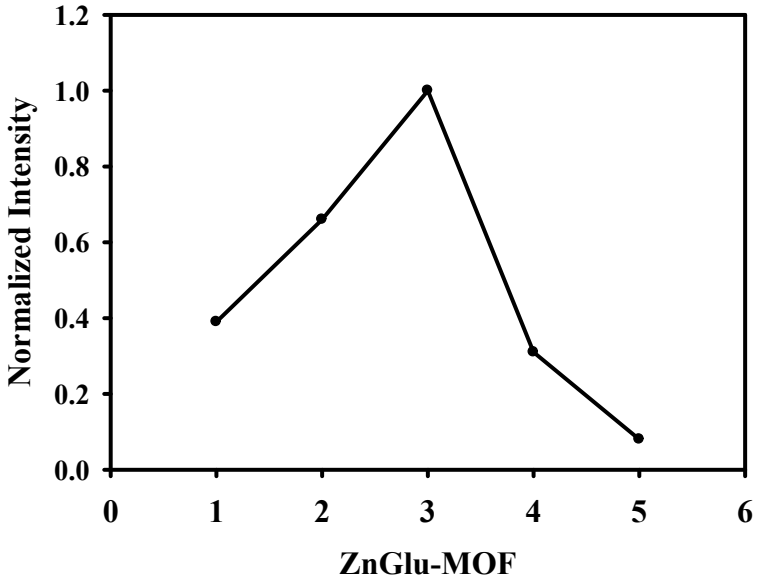

Fig. S1 Fluorescence spectra of AuNCs@ZnGlu-MOF with different portions of ZnGlu-MOF.

Table S1 Detail information for preparation of AuNCs@ZnGlu-MOF with different portions of ZnGlu-MOF.

AuNCs@ZnGlu-MOF	N = 5	N=4	N=3	N=2	N=1
$ZnSO_4.7H_2O$ (g)	0.036	0.018	0.009	0.0023	0.0012
L-glutamate (g)	0.018	0.009	0.0045	0.0011	0.0005
NaOH (g)	0.0125	0.0063	0.0031	0.0008	0.0004
Vethanol:VH_2O			1:1		
AuNCs (mL)			1		

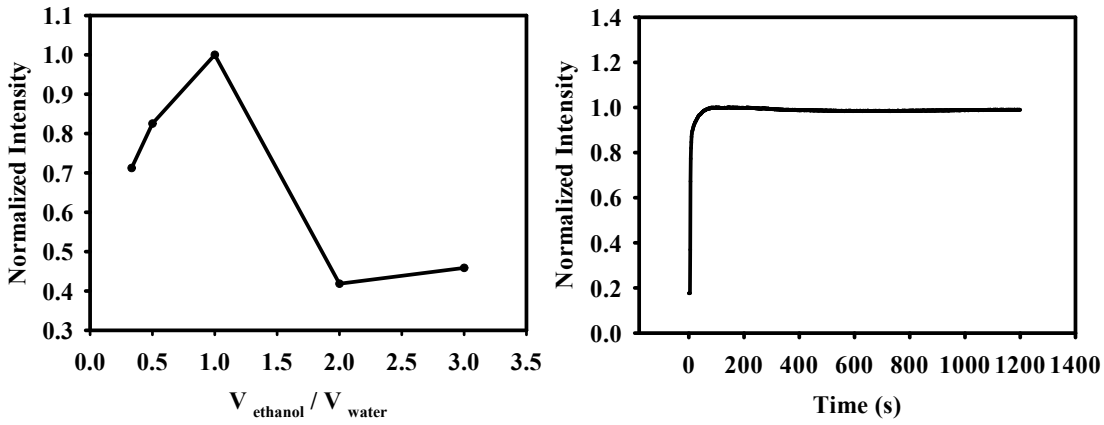

Fig. S2 Fluorescence spectra of AuNCs@ZnGlu-MOF with different ratios of ethanol and H_2O (A). Effect of reaction time (B).

		Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV): -4.85	Peak 1:	-4.85	100.0	3.75
Zeta Deviation (mV): 3.75	Peak 2:	0.00	0.0	0.00
Conductivity (mS/cm): 0.0846	Peak 3:	0.00	0.0	0.00

Result quality : Good

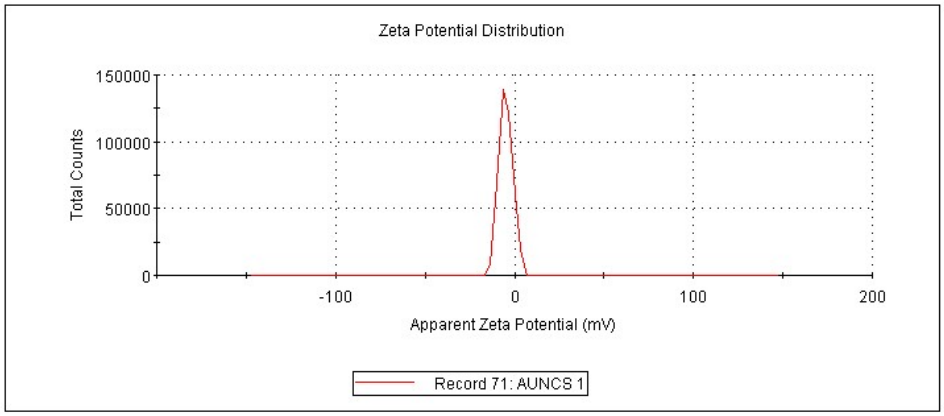

Fig. S3 Zeta potential of AuNCs.

			Mean (mV)	Area (%)	St Dev (mV)
Zeta Potential (mV):	6.53	**Peak 1:**	7.25	88.5	2.85
Zeta Deviation (mV):	3.80	**Peak 2:**	-1.39	11.5	2.03
Conductivity (mS/cm):	0.0415	**Peak 3:**	0.00	0.0	0.00
Result quality	Good				

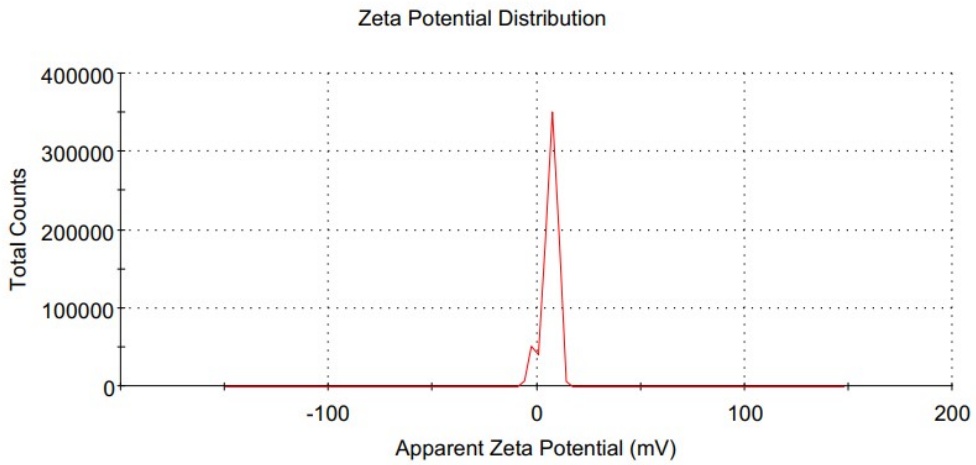

Fig. S4 Zeta potential of AuNCs-Zn^{2+}.

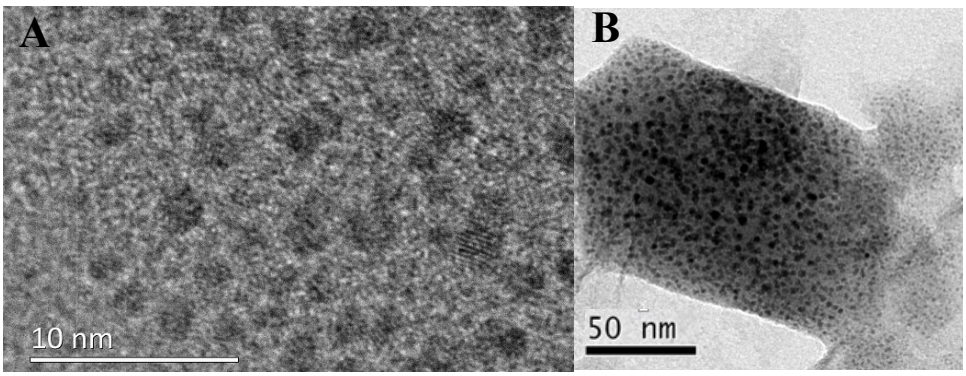

Fig. S5 TEM images of AuNCs (A), AuNCs@ZnGlu-MOF (B).

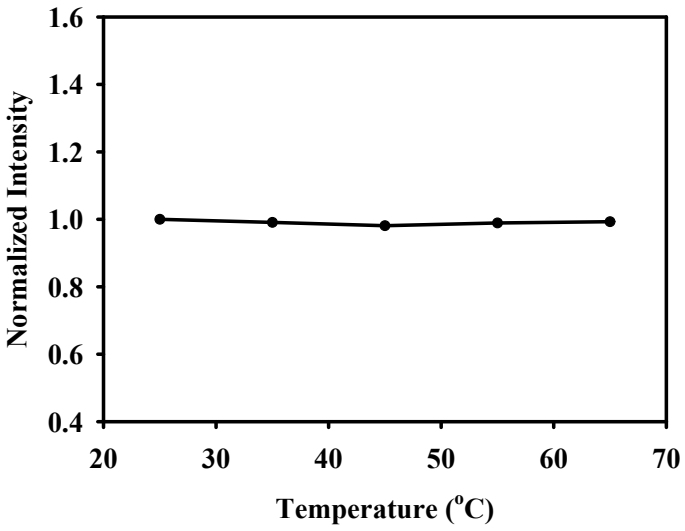

Fig. S6 Fluorescence spectra of Au NCs@ZnGlu-MOF with different tmperature (25 °C, 35 °C, 45 °C, 55 °C, 65 °C). [AuNCs@ZnGlu-MOF]: 0.1 mg/mL.

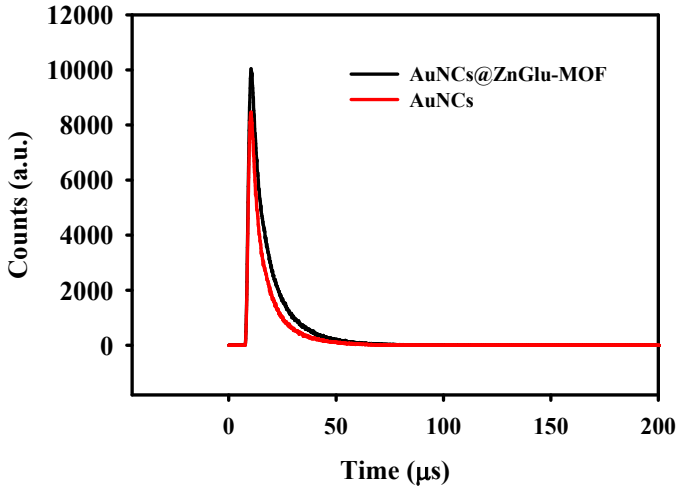

Fig. S7 The fluorescence lifetimes of AuNCs@ZnGlu-MOF in the absence (black line) and presence of I_2 (red line).

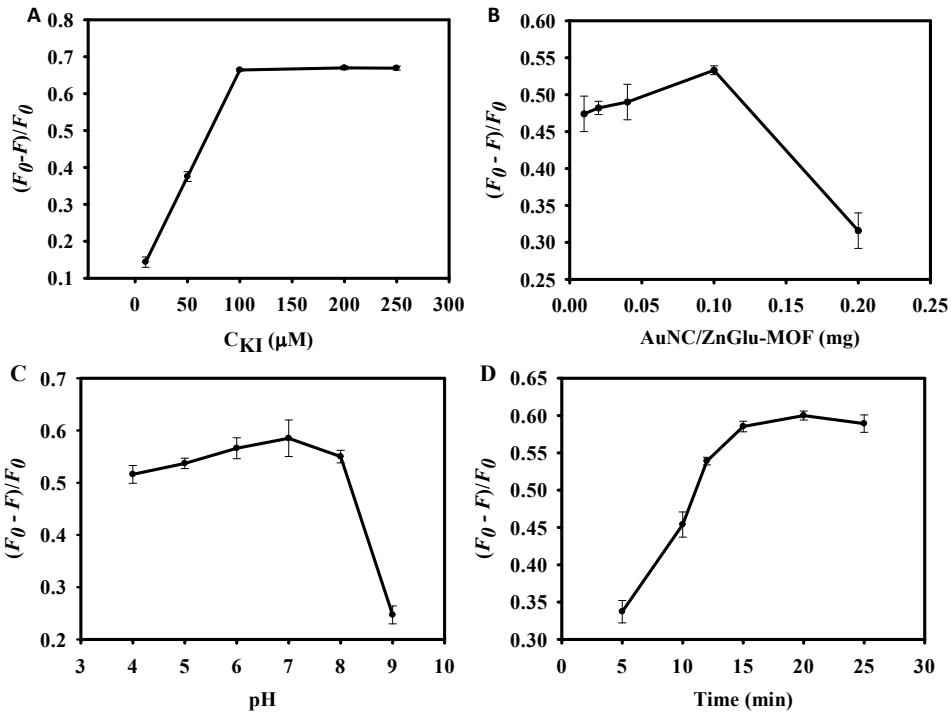

Fig. S8 Effects of I^- concentrations (A), AuNCs@ZnGlu-MOF amount (B), pH (C) and incubation time (D) on the fluorescence responce of the nanosensor for H_2O_2 detection. F_0 and F stand for the fluorescent intensities of AuNCs@ZnGlu-MOF/HRP/I^- mixture in the absence and presence of H_2O_2, respectively.

Table S2 Comparison of different methods for the determination of H_2O_2.

Methods	Linear range (μM)	Detection limit (μM)	Reference
Colorimetry	10-1000	5.29	[1]
Colorimetry	0.5-100	0.047	[2]
Colorimetry	10000-100000	54	[3]
Fluorometry	0-40	0.26	[4]
Fluorometry	0-20	0.86	[5]
Fluorometry	0-30	2.1	[6]
Fluorometry	2-50	0.57	[7]
Fluorometry	0.02-5	0.013	Present work

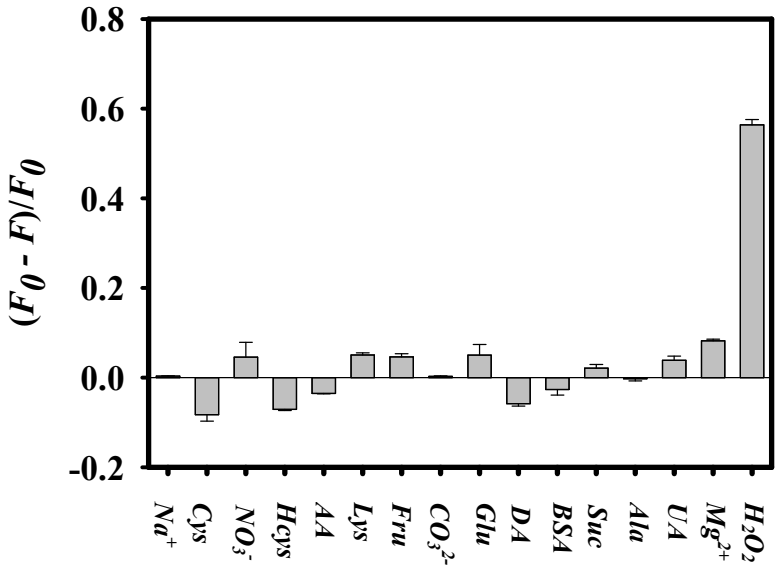

Fig. S9 Fluorescence response of AuNCs@ZnGlu-MOF in the presence of H_2O_2 or other substances (Na^+, cysteine (Cys), NO_3^-, homocysteine (Hcys), ascorbic acid (AA), lysine (Lys), fructose (Fru), CO_3^{2-}, glucose (Glu), dopamine (DA), bovine serum (BSA), sucrose (Suc), alanine (Ala), uric acid (UA)). The concentration of H_2O_2 was 5 μM, and the level of other species were 50 μM.

Table S3 Detection of spiked H_2O_2 in real samples.

Samples	Added (μM)	Measured (μM)	Recovery (%)	RSD (n=3, %)
Serum 1	0.05	0.053	106	2.98
	0.5	0.48	96.0	3.15
	2	1.97	98.5	2.36
Serum 2	0.05	0.048	96.0	1.95
	0.5	0.52	104	2.31
	2	1.95	97.5	4.16
Serum 3	0.05	0.049	98.0	2.17
	0.5	0.49	96.0	3.53
	2	1.91	95.5	2.12

Reference

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