Supporting Information

Enhancing the peroxidase-like activity of MIL-88B by ligand exchange with polydopamine

Changzhi Hu, Yuhao Xiong, Ling Liang, Weiyuan Zuo, Fanggui Ye* and Shulin Zhao

State Key Laboratory for the Chemistry and Molecular Engineering of Medicinal Resources, School of Chemistry and Pharmaceutical Science, Guangxi Normal University, Guilin, 541004, PR China

*Corresponding author: Prof. Fanggui Ye, E-mail: fangguiye@163.com; Tel: +86-773-5856104; fax: +86-773-5832294

Contents:

1. Instrument and chemicals

All chemicals were of analytical grade and were used without further purification. $FeCl_3.6H_2O$ and dopamine (DA) were purchased from Aladdin (Shanghai, China, http://www.aladdin-e.com). Terephthalic acid (BDC), TMB, H_2O_2, and anhydrous sodium acetate were purchased from Shanghai Chemical Reagent Company (Shanghai, China, https://www.sinoreagent.com). Glucose and glucose oxidase (100 U mg^{-1}) were purchased from Shanghai Sangon Bioengineering Technology Service Co., Ltd. (Shanghai, China, https://www.sangon.com). Millipore (DI) water was produced by the Millipore purification system (Bedford, MA, USA).

2. Characterization

Scanning electron microscopy (SEM) was conducted with a Quanta 200 FEG SEM (Philips, Netherlands). Transmission electron microscopy (TEM) was carried out on a Tecnai F-20 electron microscope operated at 200 kV (FEI, USA). X-ray diffraction (XRD) patterns were obtained with an X' Pert PRO diffractometer (PANalytical, Netherlands) using CuKa radiation. X-ray photoelectron spectroscopy (XPS) data were obtained using a Thermo ESCALAB 250XI electron spectrometer (Thermo, USA) using 150-W AlK alpha radiation. The data of contact Angle were obtained on the dataphysics OCA15EC contact Angle measuring instrument made in Germany. Fourier transform infrared (FT-IR) spectra (4000–400 cm^{-1}) in KBr were recorded using a PE Spectrum One FT-IR spectrometer (PE, USA). UV absorption spectra were recorded on a model Cary 60 spectrophotometer (Agilent, USA). The Zeta potential data were obtained on the Zetasizer Nano ZS, the UK made nanoparticle particle size, Zeta potential, and molecular weight analyzer. ICP-MS is manufactured by PekinElmer for FlexAR-Nexion 300X. MALDI-TOF data is obtained on the New ultra Xtreme instrument produced by Bruker, Germany.

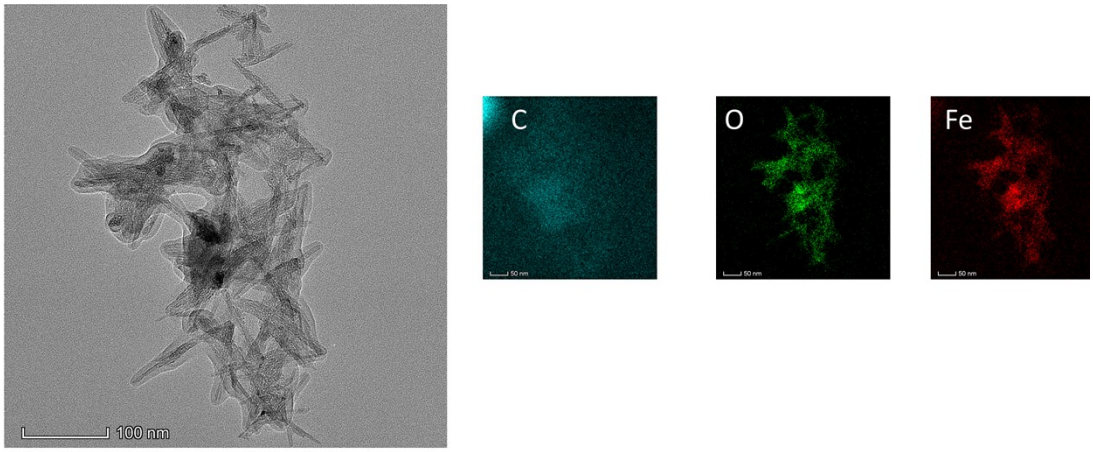

Fig. S1 TEM images of MIL-88B and EDX mapping diagrams of C, O, Fe.

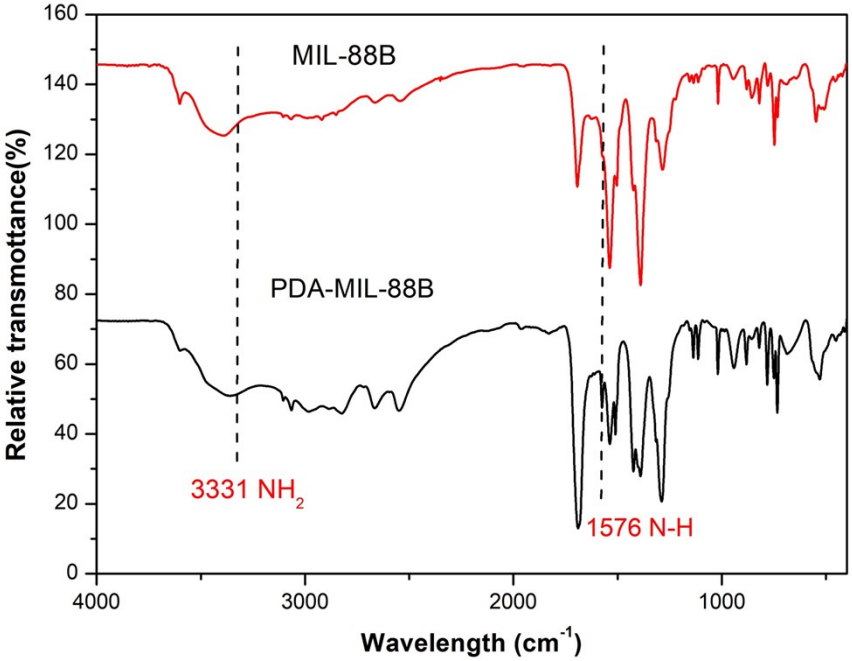

Fig. S2 The FTIR spectra of PDA-MIL-88B and MIL-88B.

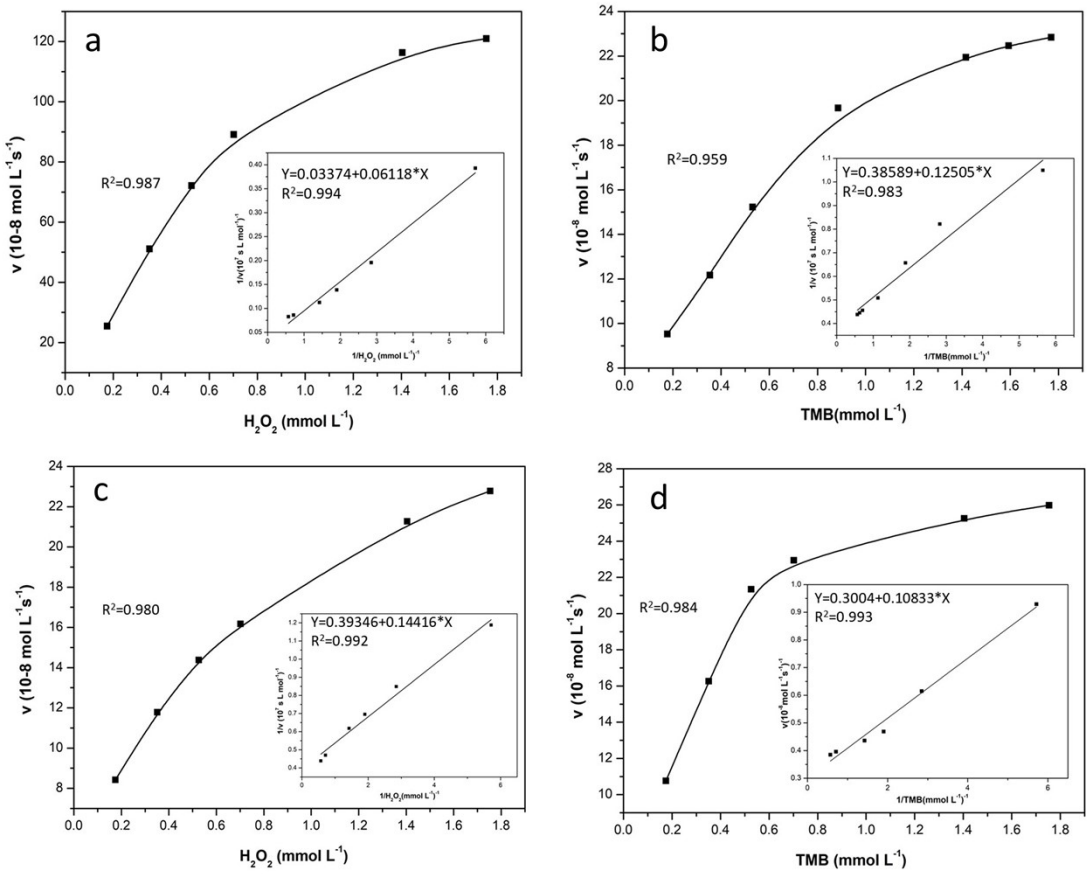

Fig. S3 Steady-state kinetic analyses using the Michaelis-Menten model and Lineweaver-Burk model (insets) for PDA-MIL-88B by varying the concentration of H_2O_2 with a fixed amount of TMB (a). Varying the concentration of TMB with a fixed amount of H_2O_2 (b). Steady-state kinetic analyses using the Michaelis-Menten model and Lineweaver-Burk model (insets) for MIL-88B by varying the concentration of H_2O_2 with a fixed amount of TMB (c). Varying the concentration of TMB with a fixed amount of H_2O_2 (d).

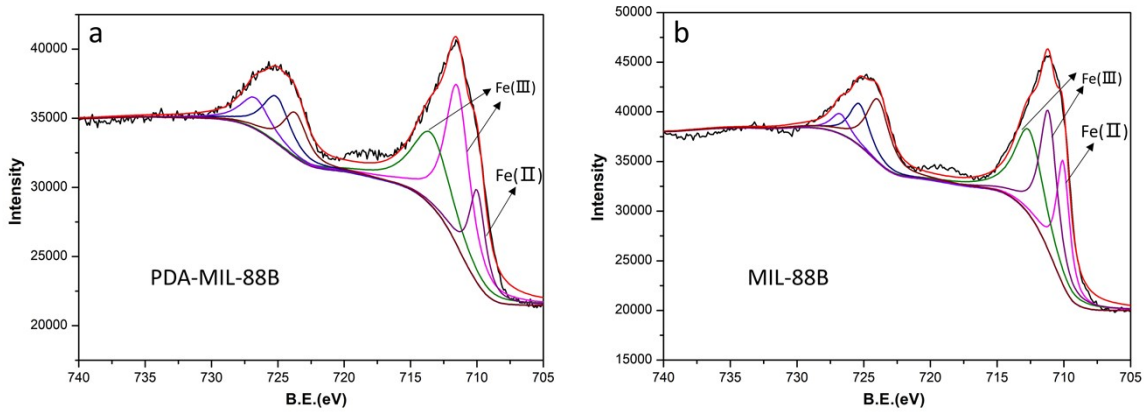

Fig. S4 XPS spectra of PDA-MIL-88B (a) and MIL-88B (b). The table contains the proportion of elements C, Fe, and N of MIL-88B and PDA-MIL-88B.

PDA-MIL-88B:

Name	Start BE	Peak BE	End BE	Height CPS	FWHM eV	Area(P) CPS.eV	Area (N) TPP-2M	Atomic %
C1s	298.57	284.8	279.77	100889.63	1.45	211924.76	2971.69	89.91
Fe2p	740.57	711.47	700.77	15833.08	5	146213.07	198.93	6.02
N1s	410.57	400.27	392.77	4189	2.88	14889.22	134.59	4.07

MIL-88B:

Name	Start BE	Peak BE	End BE	Height CPS	FWHM eV	Area(P) CPS.eV	Area (N) TPP-2M	Atomic %
C1s	298.51	284.8	279.71	90814.18	1.38	175385.44	2459.32	89.29
Fe2p	740.51	711.08	700.71	22439.64	4.18	193419.33	263.05	9.55
N1s	410.51	399.9	392.71	874.71	1.62	3547.09	32.05	1.16

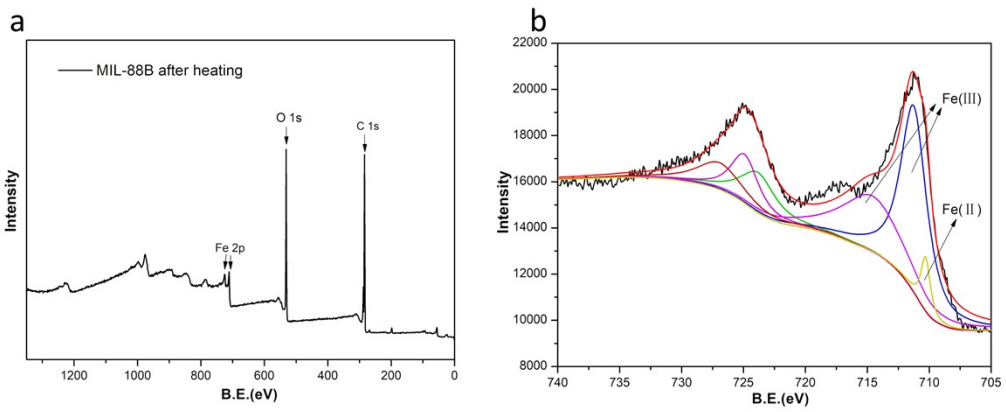

Fig. S5 XPS spectra of MIL-88B after heating (a); XPS of Fe in MIL-88B after heating (b).

Corresponding peak area data:

Peak	Position	Area	FWHM	%GL
0	606.046eV	0.100	15.574eV	80%
1	723.816eV	8677.088	3.393eV	80%
2	711.252eV	30089.920	2.533eV	80%
3	714.574eV	20824.520	5.875eV	80%
4	724.910eV	8319.177	2.677eV	80%
5	726.947eV	7315.471	4.308eV	80%
6	710.292eV	3161.209	0.907eV	80%

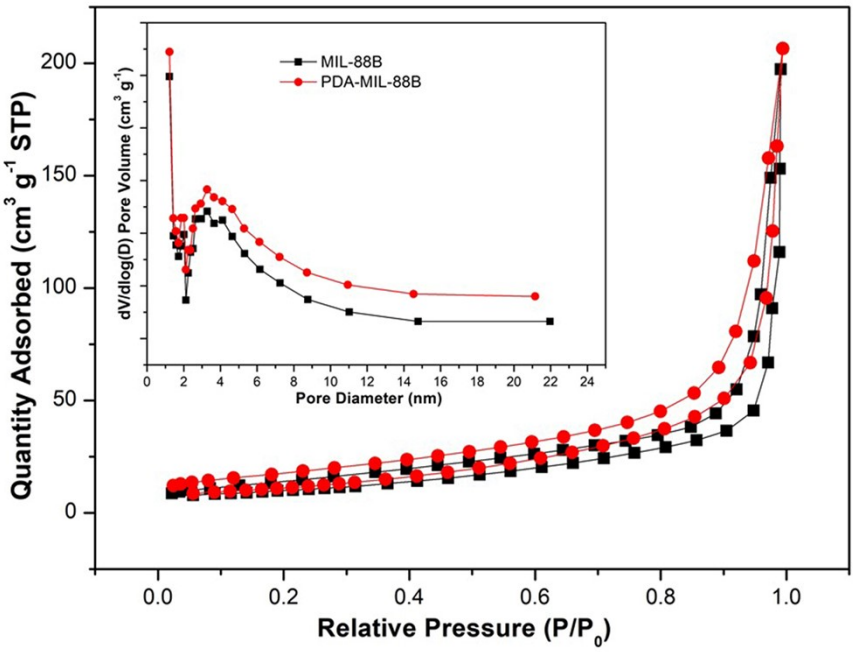

Fig. S6 N_2 adsorption-desorption curves of MIL-88B and PDA-MIL-88B (inset shows the pore size distribution curves of MIL-88B and PDA-MIL-88B).

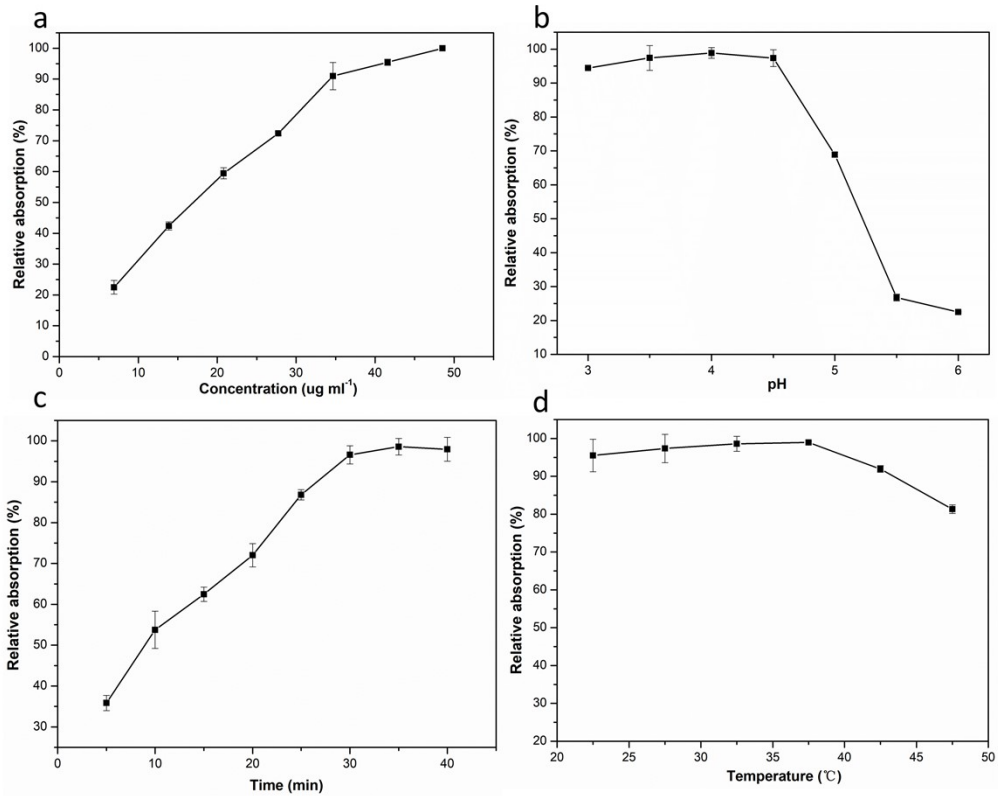

Fig. S7 Optimization of experimental conditions.

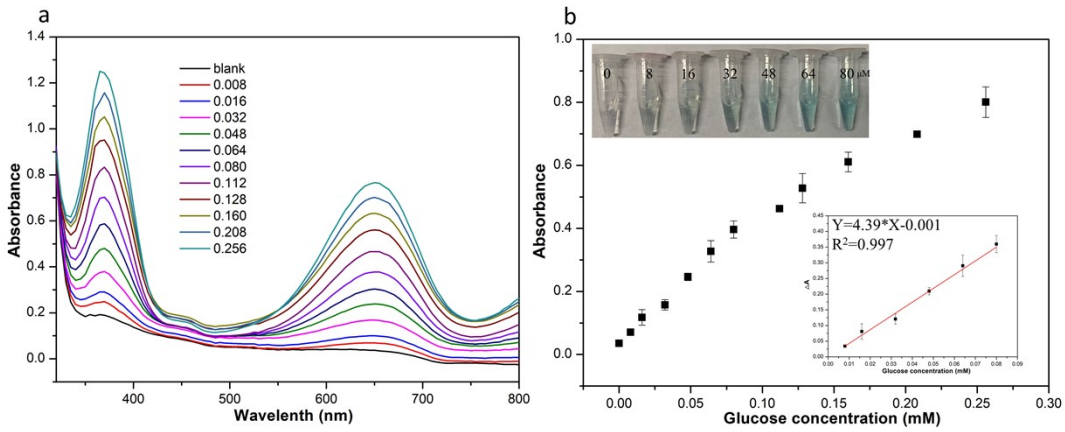

Fig. S8 After adding different concentrations of glucose, the UV-visible absorbance at 650 nm changes (a). The variation trend of absorbance with glucose concentration and the linear fitting line between absorbance and glucose concentration (insets) (b).

Table S1 A comparison of different nanozymes materials for detection of H_2O_2 and glucose

Materials	Method	Linear range of H_2O_2/ Limit of detection (μM)	Linear range of glucose/ Limit of detection (μM)	Reference
Fe-CDs	Colorimetry	6-42 /0.93	10-70 /1.73	[1]
PDI-Co_3O_4	Colorimetry	3-60/2.37	5-100 /2.77	[2]
Au@TiO_2	Colorimetry	5-100/4.00	0-10 /3.5	[3]
CQDs	Colorimetry	5-60/0.86	10-200/2.89	[4]
Fe-CDs	Fluorescence	0-133/0.47	0-300/2.5	[5]
UCNPs	Fluorescence	2.5-70/0.8	7-110/2.3	[6]
CQDs/Cu_2O	Electrochemistry	5-5300/2.8	20-4300/8.4	[7]
PDA-MIL-88B	Colorimetry	2.2-52.8/0.6	4.4-52.8/1.1	This work

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Table S2 Comparison of traditional enzymatic method and colorimetric method for determination of glucose in human serum

Sample	glucose content by conventional enzymatic [a] method (mM)	Glucose content by colorimetric method (mM) Mean [b] ± SD [c]	relative error (%)	RSD (%)
Sample 1	5.07	5.23±0.10	+3.1	1.9
Sample 2	4.85	4.80±0.04	-1.0	0.8
Sample 3	5.00	5.19±0.13	+3.7	2.5
Sample 4	4.81	4.77±0.05	-0.8	1.0
Sample 5	5.48	5.72±0.21	+4.2	3.4
Sample 6	5.77	5.75±0.06	-0.3	1.1

a: The data comes from the hospital report;

b: n = 3;

c: SD: Standard Deviation

Sample	Original (μM)	Added (μM)	Found (μM)	Recovery (%)	RSD (%)
		4.4	21.10±0.50	97.72	2.4
Sample 2	16.8	8.8	26.06±0.82	105.2	3.2
		16.7	33.39±0.44	99.34	1.4
		8.8	26.10±0.23	97.73	1.3
Sample 3	17.5	16.7	35.82±1.10	109.7	1.8
		26.3	46.31±0.14	108.4	0.6

Table S3 The recovery test of our assay for detecting glucose in human serum.