Supplementary Materials

Colorimetric sensor based on the oxidase-like activity of Au@MnO_x nanozyme for high-sensitivity detection of malathion

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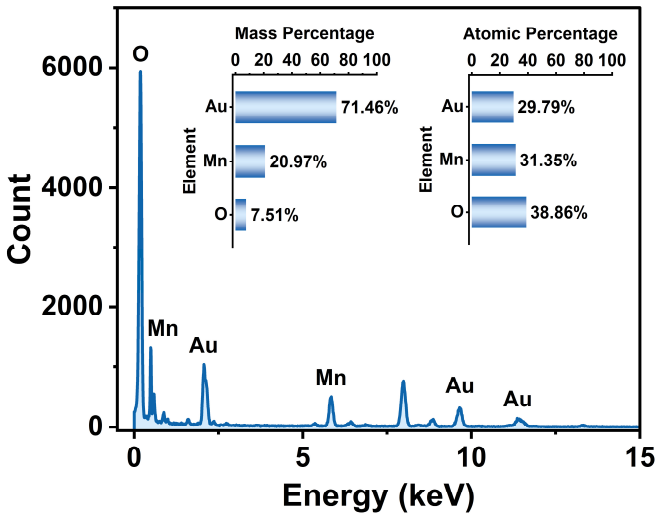


Figure S1. EDS spectrum and quantitative elemental analysis of Au@MnO_x.

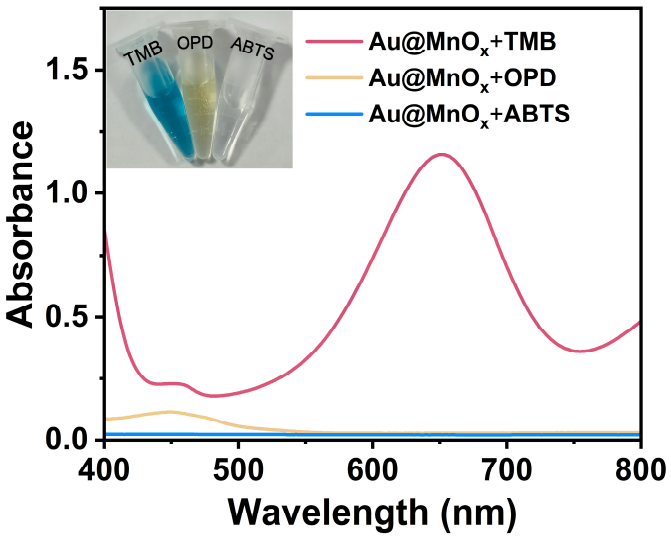


Figure S2. UV-vis absorption spectra of the oxidation of different chromogenic substrates catalyzed by Au@MnO_x. Experimental conditions: pH 4.0 HAc-NaAc buffer, 3 mM TMB, 100 μg/mL Au@MnO_x.

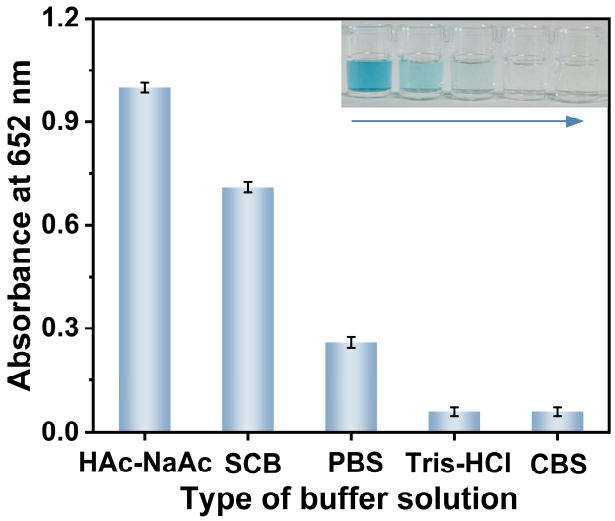


Figure S3. Effect of buffer solution type on the catalytic oxidation of TMB by Au@MnO_x.

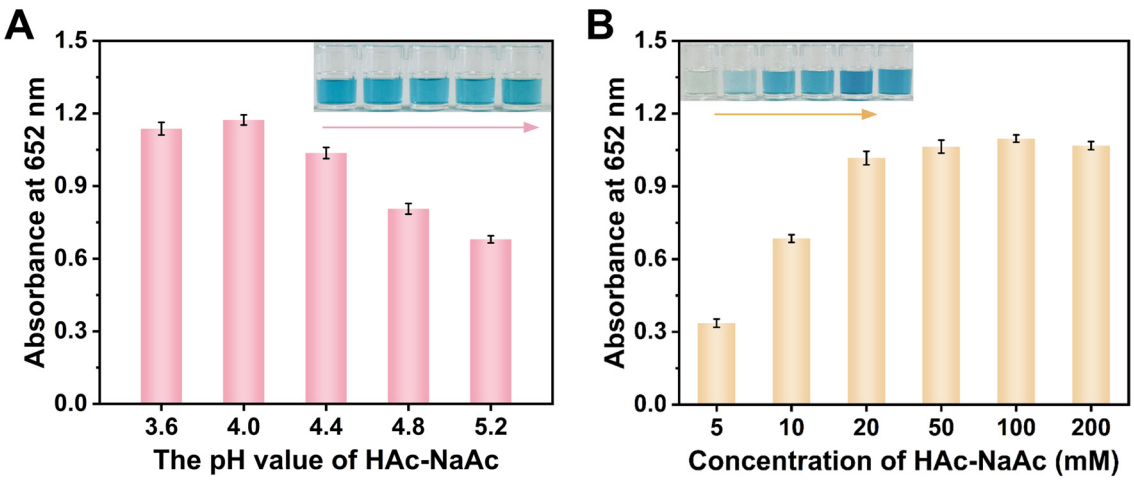


Figure S4. Effect of (A) pH value and (B) concentration of HAc-NaAc buffer on the catalytic oxidation of TMB by Au@MnO_x.

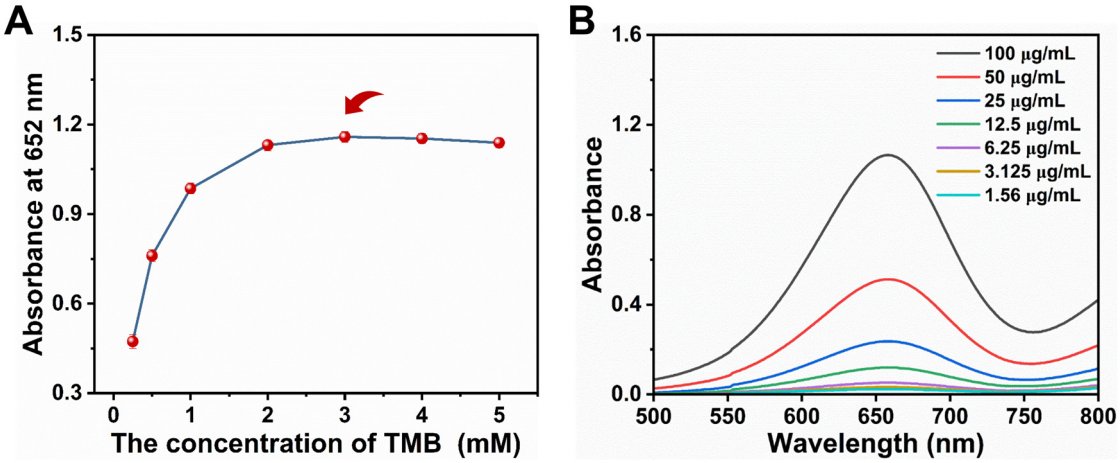


Figure S5. Optimization of (A) TMB concentration and (B) Au@MnO_x concentration on the catalytic chromogenic performance.

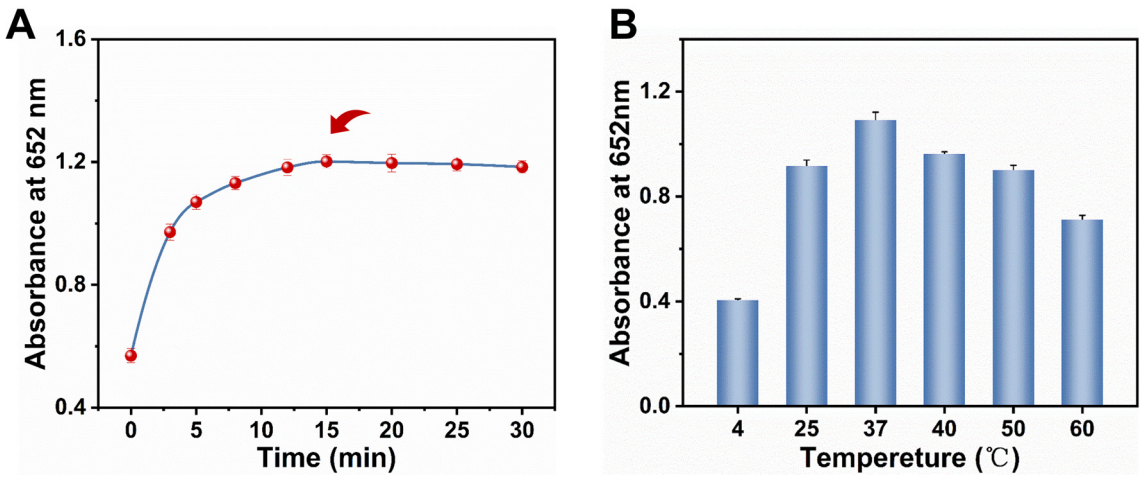


Figure S6. Effect of (A) reaction time and (B) temperature on the catalytic chromogenic performance of Au@MnO_x toward TMB.

Table S1. Kinetic parameters of the Au@MnO_x and other nanozymes catalysts.

Catalyst	K_m (mM)	V_{max} (10^{-8} M·s^{-1})	References
PDA-Pd/NCs	0.211	19.4	[47]
Mn@NC	0.378	18.24	[48]
MCDs@PB	0.56	11.12	[49]
AuPt@Fe-N-C	0.2199	11.05	[30]
Fe_1/SCN	0.067	4.70	[50]
Au@Pt	0.199	7.457	[51]
Au@Pd	0.6366	4.191	
Au@MnO_x	0.146	10.95	This work

Table S2. Comparison of analytical performance with other OPs detection methods.

Materials	Method	Linear range (ng/mL)	LOD (ng/mL)	References
Pt-Ni NPs	Colorimetry	5–2500	1.2	[5]
Fe-MOF	Colorimetry	10–500	5.8	[52]
	Electrochemical	10–500	4.6	
GSH-AuNCs	Fluorescence	10–2000	2.05	[53]
Ce/Zr-MOF@FP	Colorimetry	0.5–500	0.32	[54]
Cu-MOFs	Colorimetry	0–1000	16	[55]
Au@MnO_x	Colorimetry	0–500; 500–3000	1.51	This work

Table S3. Recovery and precision of the proposed method for malathion detection in actual food samples.

Samples	Spiked level (μg/g)	Found value (μg/g)	Recovery (%)	RSD (%, n=3)
Cucumber	0	ND	−	−
	0.1	0.103±0.0067	103.0	6.5
	0.5	0.486±0.0185	97.2	3.8
	2.0	2.09±0.1087	104.5	5.2
Cabbage	0	ND	−	−
	0.1	0.101±0.0059	101.0	5.8
	0.5	0.497±0.0263	99.4	5.3
	2.0	2.05±0.1292	102.5	6.3

ND, not detected; −, values could not be calculated.