

Supplementary Information

Mesoporous silica-supported platinum nanocatalysts for detection of glucose, cholesterol, and C-reactive protein

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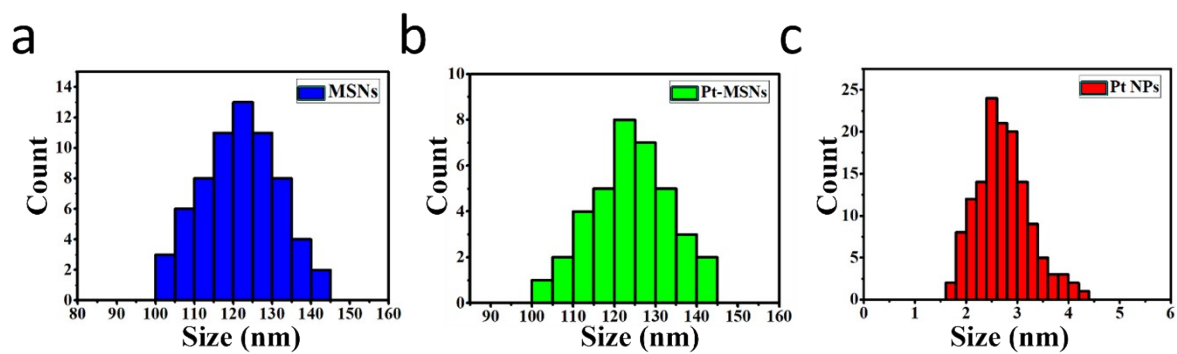


Fig. S1 Size distributions of (a) MSNs, (b) Pt-MSNs, and (c) Pt NPs. Average sizes are 121.9 ± 10.1 , 124.3 ± 9.5 , and 2.8 ± 0.5 nm for MSNs, Pt-MSNs, and Pt NPs, respectively.

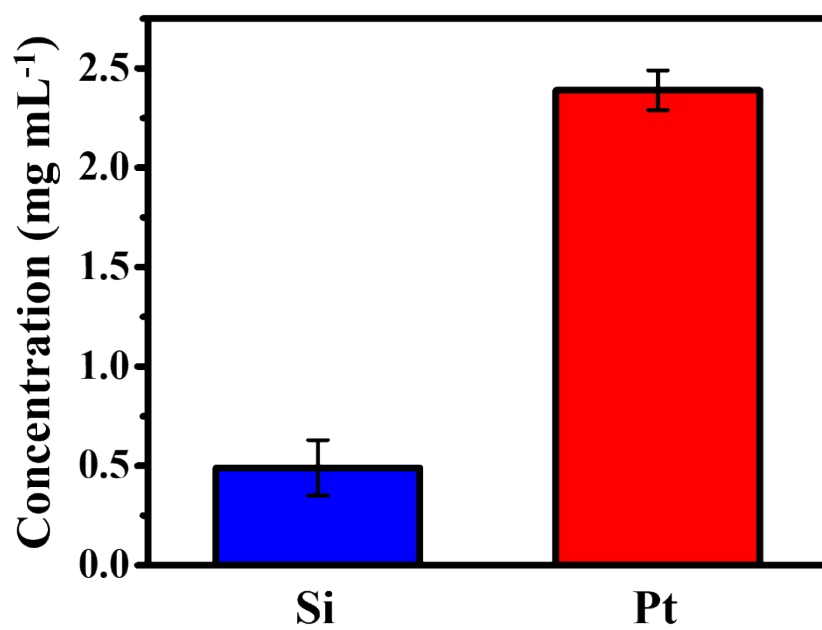


Fig. S2 ICP-AES data of Pt-MSNs. [Si] = 0.49 mg mL⁻¹ and [Pt] = 2.39 mg mL⁻¹.

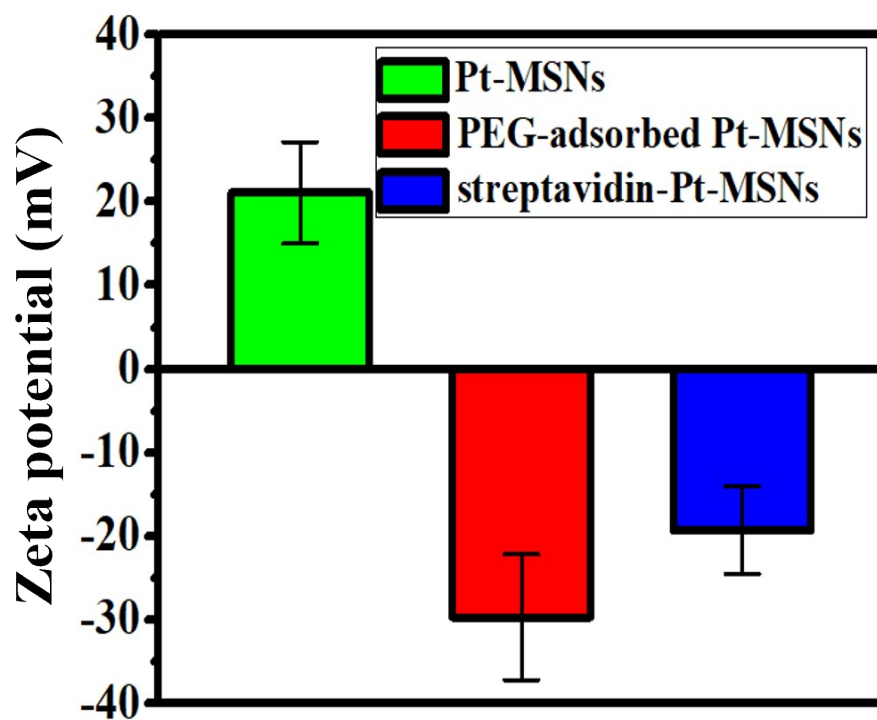


Fig. S3 Zeta-potential values of Pt-MSNs, PEG-adsorbed Pt-MSNs, and streptavidin-Pt-MSNs.

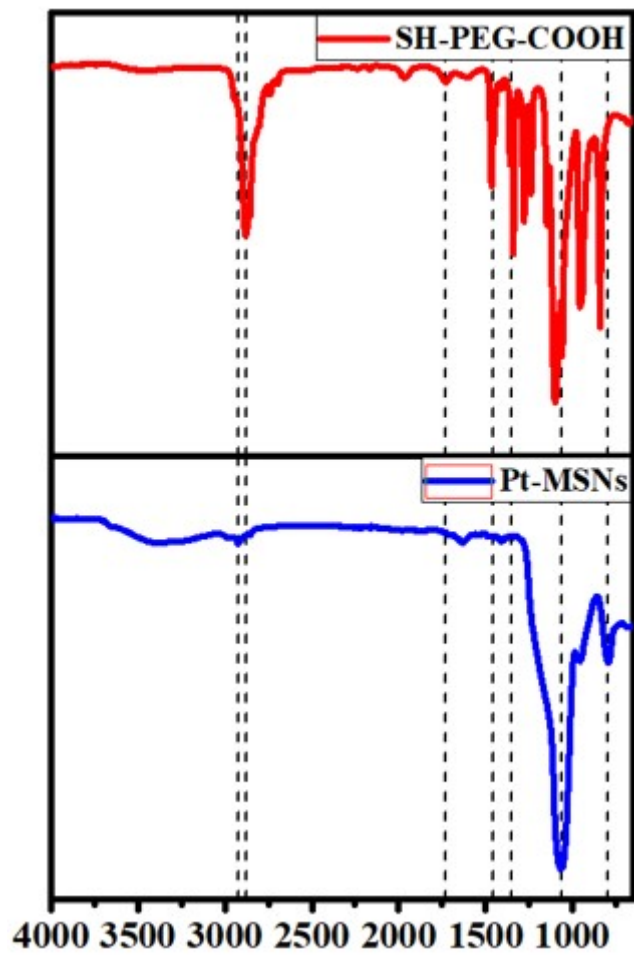


Fig. S4 FT-IR spectra of SH-PEG-COOH and Pt-MSNs.

Table S1 Comparison of the kinetic parameters of Pt-MSNs, HRP, and other Pt-based nanomaterials. K_M : Michaelis-Menten constant, V_{max} : maximum velocity, and K_{cat} : catalytic constant.

Catalyst	Substrate	K_M (mM)	$V_{max} \times 10^{-8}$ ($M s^{-1}$)	K_{cat} (s^{-1})	Ref.
Pt-MSN	TMB	0.635	112	7.88×10^4	This study
	H ₂ O ₂	155	63.1	4.44×10^4	This study
HRP	TMB	0.434	10.0	4.00×10^3	1
	H ₂ O ₂	3.70	8.71	3.48×10^3	
ISPtNP	TMB	0.120	126	2.27×10^4	2
	H ₂ O ₂	769	185	1.55×10^4	
Fe₃O₄@PtNP	TMB	0.147	7.11	84.1	3
	H ₂ O ₂	703	71.4	84.4	
Pt hollow nanodendrites	TMB	0.81	12.0	0.017	4
	H ₂ O ₂	6.90	9.90	0.014	
PVP-PtNC	TMB	0.022	105	6.29×10^4	5
	H ₂ O ₂	3.92	36.1	2.16×10^4	

Table S2 Comparison of the linear ranges and LOD values of Pt-MSN- and previous reported Pt-based glucose assays.

Probe	Method	Marker	Linear range (mM)	Limit of detection (LOD) (μM)	Ref.
Pt-MSN	Colorimetric	Glucose	0.08 - 2.5	20	This study
PtCuCo nanostructure	Colorimetric	Glucose	0.20 - 1.5	80	6
Au-PtNCs-GMP	Colorimetric	Glucose	0.05 – 0.40	11	7
CCNP	Colorimetric	Glucose	0.10 - 10	2896	8
Platinum electrode	Amperometric	Glucose	1.0 – 10	800	9
Gox-PoPD/PtNPs/PVF⁺ClO₄⁻/Pt	Amperometric	Glucose	0.06 - 9.6	18	10
Pt/MWNT	Amperometric	Glucose	1.0-23	50	11

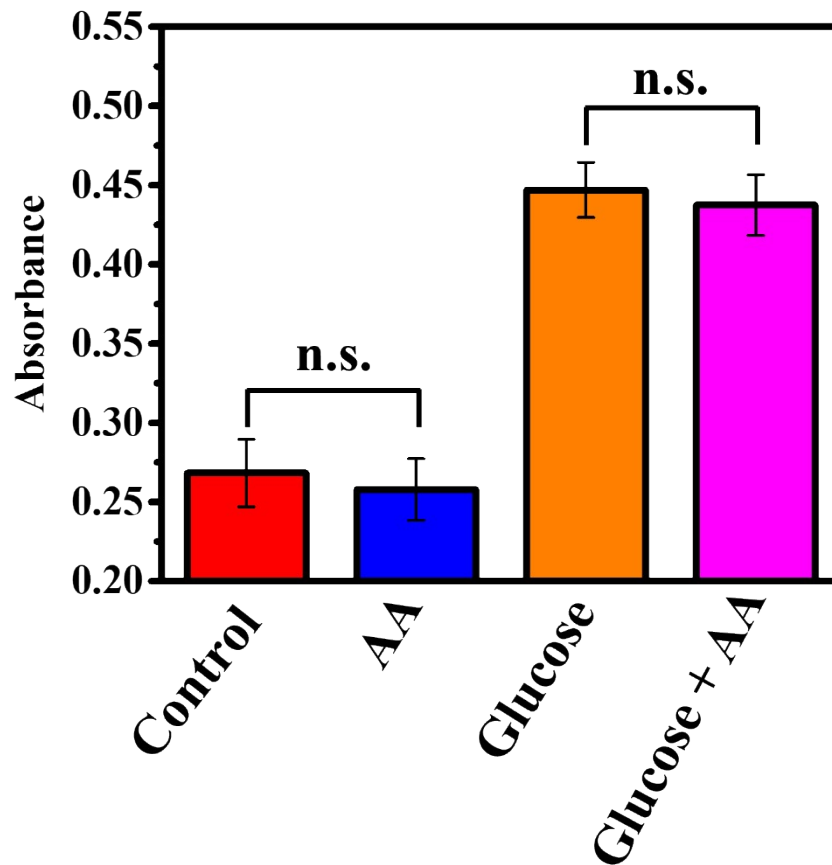


Fig. S5 Specificity test results of glucose in the presence of ascorbic acid (AA) at normal blood concentration ($n = 7$). $[\text{glucose}] = 2 \text{ mM}$, $[\text{AA}] = 45 \text{ }\mu\text{M}$. Data were analyzed by Mann-Whitney U test. n.s. > 0.05 compared with the control.

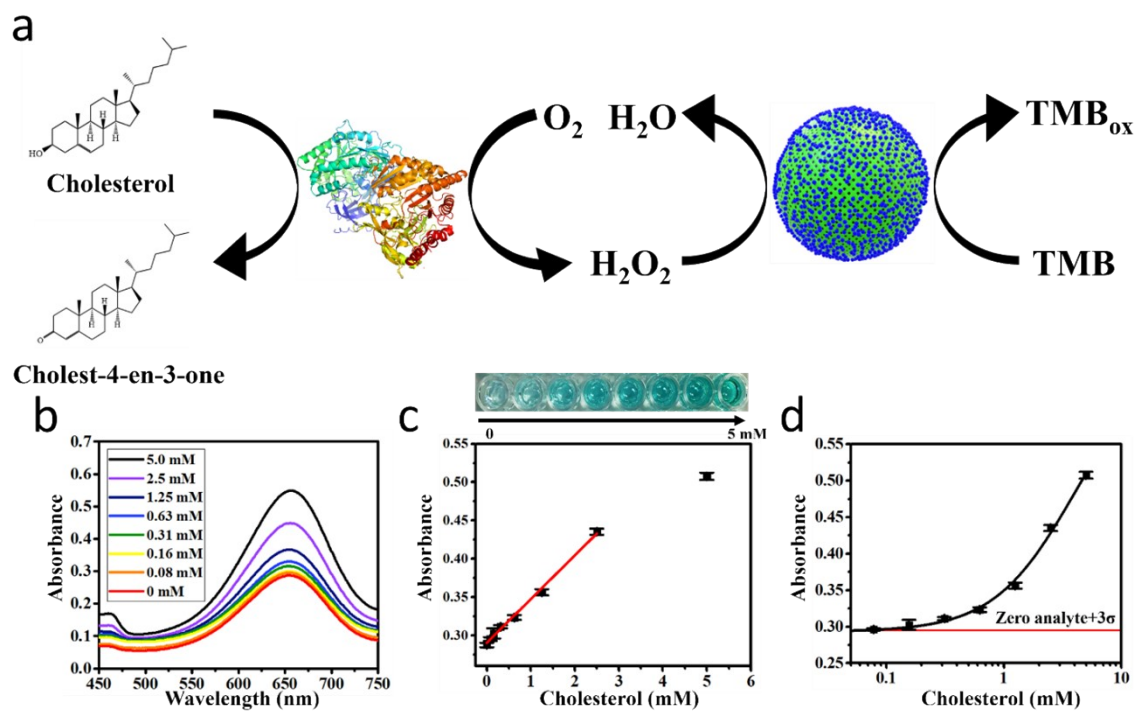


Fig. S6 Detection of cholesterol using Pt-MSNs. (a) Schematic diagram showing the two-step cascade reaction. (b) Cholesterol concentration-dependent absorbance change of the sample solution. (c) Linear response range of the assay ($n = 3$). (d) Semi-log calibration plot showing the detection limit.

Table S3 Comparison of LOD values and linear ranges of Pt-MSN- and previously reported Pt-based CRP immunoassays.

Probe	Method	marker	Linear range (pM)	Limit of detection (LOD) (pM)	Ref.
Pt-MSN	Colorimetric	CRP	1.4 – 87.0	3.9	This study
MPN	Colorimetric	CRP	10.4 – 339.1	5.7	12
Pt-MDMC	Colorimetric	CRP	13 – 2174	14.6	13
AuPtRh NBC	Amperometric	CRP	0.4 – 4.3 μ M	0.3	14
Pt/Ru/C nanoparticle	Amperometric	CRP	8.7 – 869.6	4.3	15

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