Electronic Supplementary Material (ESI) for Analytical Methods.

Platinum Glutamate Acid Complex as a Peroxidase Mimic: High Activity, Controllable Chemical Modification, and Application in Biosensor

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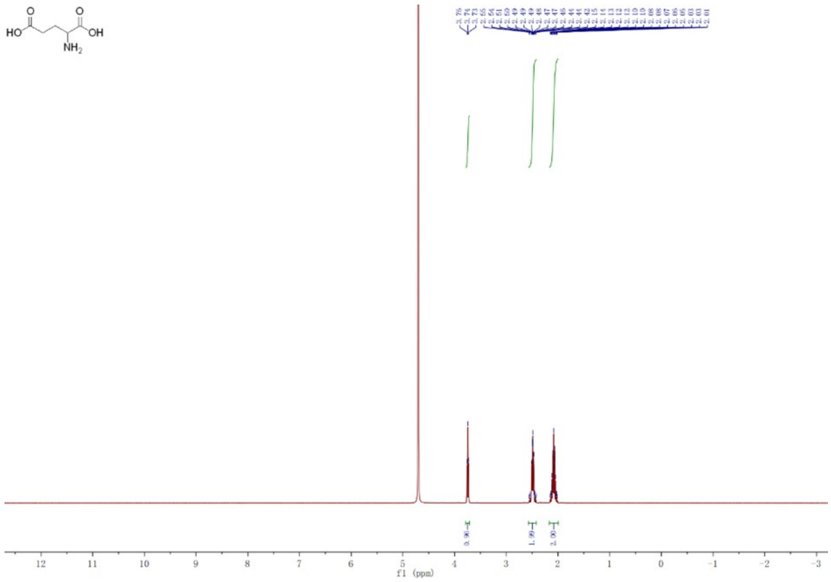
Determination of the Michaelis-Menten constant

Ethanol was employed as a solvent to prepare a 5mM solution of TMB, while water served as the solvent for the precise formulation of a 1mM solution of Glu-Pt. A comprehensive range of H_2O_2 concentrations (5, 4.5, 4, 3.5, 3, 2.5, 2, 1.5, 1, 0.5, 0.2mM) was prepared. Each well of a microplate received 80μL of Glu-Pt and 80μL of TMB, separately. Subsequently, 40μL of H_2O_2 at varying concentrations was meticulously added to each well. The final concentrations in the microplate were 2mM for TMB, 0.4mM for Glu-Pt, and diverse concentrations of H_2O_2 (1, 0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2, 0.1, 0.04mM). Each concentration set underwent a meticulous triplicate parallel experimentation. The microplate underwent uniform shaking, initiating an 8-minute reaction period. Following this, the absorbance at 652 nm was precisely measured using a microplate reader. C/V curves and double reciprocal curves were adeptly generated to gain comprehensive insights into the reaction dynamics. The determination of the Michaelis-Menten constant (K_m) was carried out to provide a quantitative measure of the enzymatic activity.

Glutamic acid

[1]H NMR (400 MHz D_2O): δ 3.74 (t, J = 6.4 Hz, 1H), 2.55–2.42 (m, 2H), 2.15–2.01 (m, 2H).



Platinum glutamic acid complex:

[1]H NMR (400 MHz D_2O): δ 4.07 (t, J = 6.7 Hz, 2H), 2.61–2.57 (m, 4H), 2.24–2.12 (m, 4H).

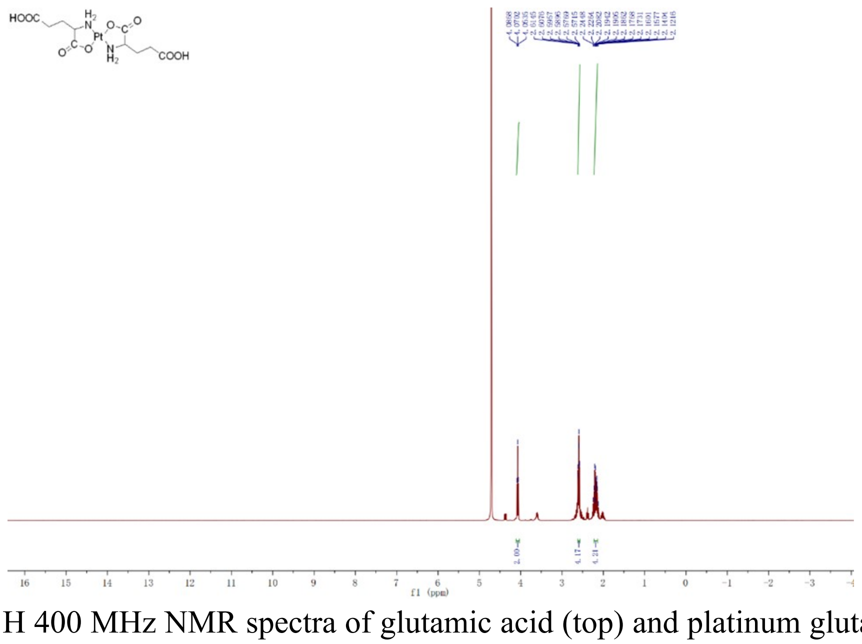


Fig. S1. 1H 400 MHz NMR spectra of glutamic acid (top) and platinum glutamic acid complex (bottom).

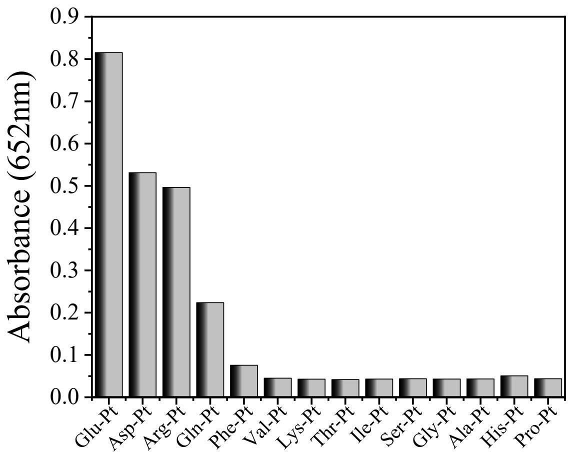


Fig. S2. The comparison of peroxidase-like activity of platinum complexes formed with amino acids.

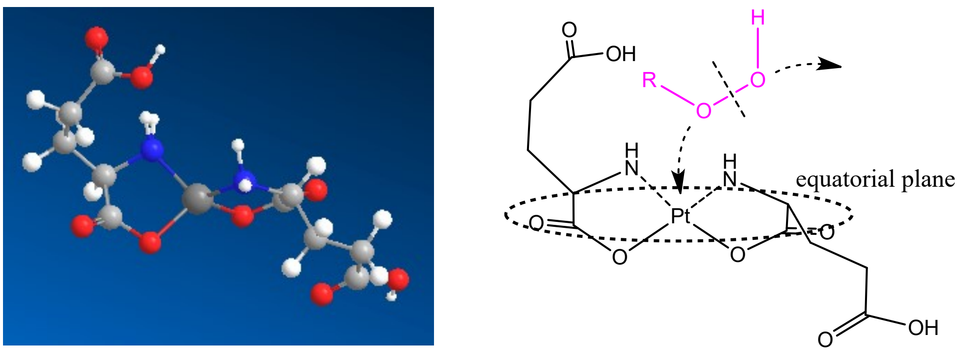


Fig. S3. The structure of $Pt(Glu)_2$ (right) and a schematic representation of its coordination with H_2O_2 (left).

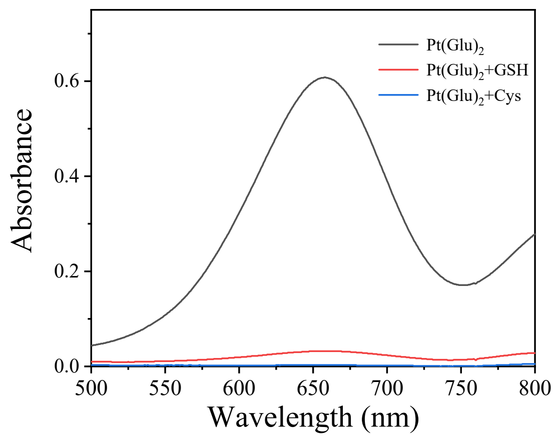


Fig. S4. The absorption spectra obtained from the H_2O_2 and TMB in the presence of $Pt(Glu)_2$, $Pt(Glu)_2$+GSH, and $Pt(Glu)_2$+ cysteine.

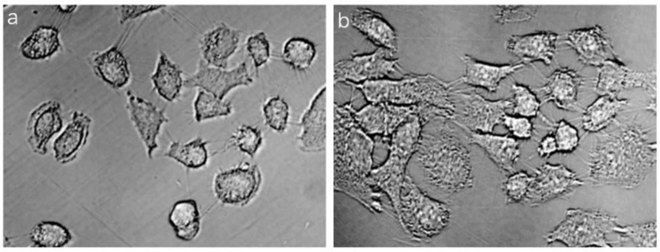


Fig. S5. Bioimaging HCCLM3 incubated with the mixture of GOx and $Pt(Glu)_2$ (a) and GOx chemically modified with $Pt(Glu)_2$(b).

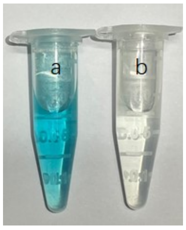


Fig. S6. Color change upon the addition of cholesterol in the ChOx-$Pt(Glu)_2$/TMB (a) and ChOx/TMB (b).

Table S1. Comparison of nanozyme-based detection methods for cholesterol detection.

Sensing system	Analytical method	Linear range (μM)	LOD (μM)	Reference
Nanoporous Gold	Electrochemistry	50-6000	8.4	1
ChOx/CS-GR/GCE	Differential Pulse Voltammetry	5-1000	0.715	2
carbon dot/hemoglobin	Fluorometry	0-800	56	3
N-GQDs/Chromium Picolinate	Fluorometry	0-520	0.4	4
Boron nitride nanosheet@CuS	Colorimetry	10-100	2.9	5
Fe_3O_4 magnetic nanoparticles	Colorimetry	2-50	0.8	6
Polypyrrole NPs	Colorimetry	10-100	3.5	7
$Pt(Glu)_2$	Colorimetry	0.1-80	0.56	This work

Table S2. Comparison of other detection methods for ALP detection

Sensing system	Analytical method	Linear range(U/L)	LOD (U/L)	Reference
CdSe nanoparticles	Electrochemistry	2-25	2	8
Lumin-SiNPs	Electrochemistry	5-50	0.8	9
Dopamine-resorcinol	Fluorometry	0.1-6.0	0.07	10
O-phenylenediamine - Ascorbic acid 2-phosphate	Fluorometry	0.1-30	0.06	11
N-CDs	Fluorometry	2.5-45	0.4	12
Cu Alkyne–azide cycloaddition and DNA-templated CuNPs	Fluorometry	100-1600	50	13
Ce^{4+}-TMB	Colorimetry	50-250	2.3	14
Fe_{55}-N-C	Colorimetry	0.05-20	0.03	15
Fe(II)-phenanthroline	Colorimetry	0-220	0.94	16
AuNPs-cystine	Colorimetry	0.2-20	0.2	17

Cu-MOF/**Pyrophosphate**	Colorimetry	1-34	0.19	18
Polydiacetylenes liposomes	Colorimetry	10-200	2.8	19
Cu-C_3N_4-550	Colorimetry	0.4-20	0.32	20
FeCo NPs	Colorimetry	0.6-10	0.49	21
Fe–N–C single-atom nanozymes	Colorimetry	0.1-1.5	0.05	22
$Pt(Glu)_2$	Colorimetry	0.5-12	0.09	This work

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