

Supporting Information

Investigating the oxidase-like activity of a Co-Fe Prussian blue analog nanocube prepared in situ and its applications in colorimetric detection of ascorbic acid, alkaline phosphatase, α -glucosidase, and ascorbic acid oxidase

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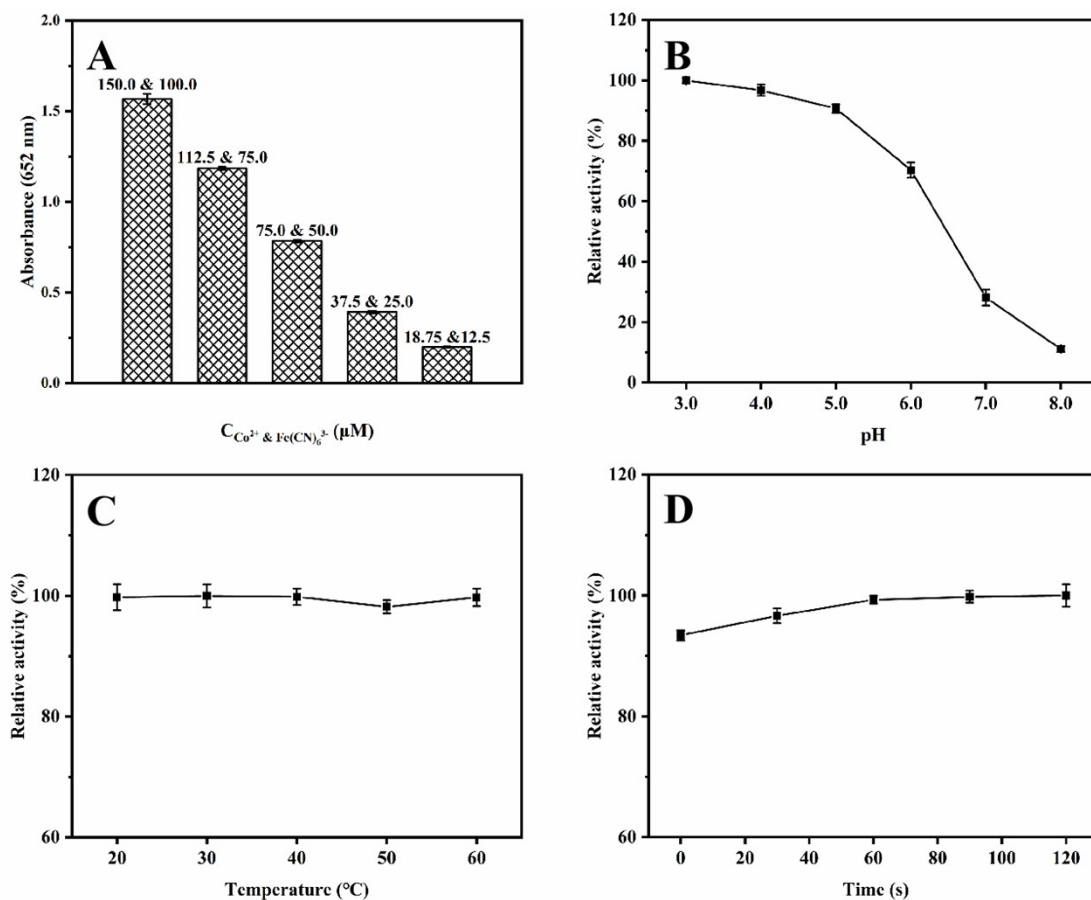


Fig. S1. Effect of the concentration of Co^{2+} and Fe(CN)_6^{3-} (**A**), pH (**B**), temperature (**C**), and incubation time (**D**) on the oxidase-like activity of Co-Fe PBA NC. Other conditions: 75.0 μM of $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$, 50.0 μM of $\text{K}_3\text{Fe(CN)}_6$, and 2.5 mM of TMB. The maximum point in each curve is set as 100%. The error bars represent the standard deviations of three independent measurements.

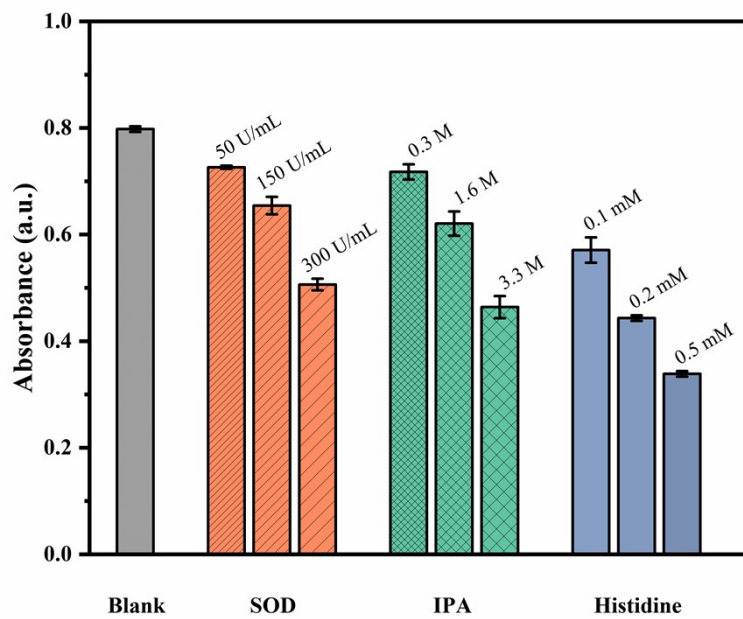


Fig. S2. Effects of various active scavengers on the catalysis of TMB by Co-Fe PBA NC nanozyme. Error bars represent the standard deviations of three independent measurements.

Table S1. Comparisons of the kinetic parameters of Co-Fe PBA NCs, HRP, and some reported nanozymes.

Catalysts	Substrate	K_m (mM)	V_{max} (10^{-8} M s^{-1})	Ref.
HRP		0.434	10.00	1
PCN-224-Mn		0.243	13.72	2
BSA-SeNPs	TMB	0.859	0.53	3
CS-SeNPs		0.852	2.38	3
IrNPs		0.280	13.650	4
Co-Fe PBA NC		0.163	0.835	This work

HRP: horseradish peroxidase; PCN-224-Mn: Mn-modified porphyrin metal-organic framework; BSA-SeNPs: selenium nanoparticles synthesized with bovine serum albumin; CS-SeNPs: selenium nanoparticles synthesized with chitosan; IrNPs: Iridium nanoparticles.

Table S2. Comparisons of the colorimetric detection of AA, ALP, α -Glu, and AAO by using various peroxidase mimics.

Nanozyme	Analyte	Linear range	LOD	Ref.
IrO ₂ /MnO ₂	AA	0–312.5 μ M	1.23 μ M	5
CeVO ₄	ALP	1–210 U/L	0.68 U/L	6
Gold Nanorod	ALP	5–100 U/L	3.3 U/L	7
SA-Pt/CN	α -Glu	10–8000 U/L	3.8 U/L	8
MnO ₂ NS	α -Glu	200–8000 U/L	30.0 U/L	9
PLPs	AA	1.0–45.0 μ M	0.2 μ M	10
	AAO	1–20 U/L	0.25 U/L	
DNA-Au/Ag NC	AA	5.0–150.0 μ M	0.6 μ M	11
	AAO	10–200 U/L	4.8 U/L	
Co-Fe PBA NC	AA	1.0–15.0 μ M	0.40 μ M	This work
	ALP	5–120 U/L	0.91 U/L	
	α -Glu	10–200 U/L	8.54 U/L	
	AAO	0.25–5 U/L	0.16 U/L	

AA: ascorbic acid; ALP: alkaline phosphatase; α -Glu: α -glucosidase; AAO: ascorbate oxidase; SA-Pt/CN: Pt single-atom; MnO₂ NS: MnO₂ nanosheet; PLPs: persistent luminescent particles; DNA-Au/Ag NC: DNA-templated gold-silver nanoclusters.

References

- 1 L.Z. Gao, J. Zhuang, L. Nie, J.B. Zhang, Y. Zhang, N. Gu, T.H. Wang, J. Feng, D.L. Yang, S. Perrett and X. Yan, *Nat. Nanotechnol.*, 2022, **2**, 577-583.
- 2 X. Lai, Y. Shen, S.B. Gao, Y.J. Chen, Y.S. Cui, D.X. Ning, X.B. Ji, Z.W. Liu and L.G. Wang, *Biosens. Bioelectron.*, 2022, **213**, 114446.
- 3 H. Cao, J.Y. Xiao and H.M. Liu, *Biochem. Eng. J.*, 2020, **152**, 107384.
- 4 M.L. Cui, Y. Zhao, C. Wang and Q.J. Song, *Microchim. Acta*, 2017, **184**, 3113-3119.
- 5 Y.Y. Zhong, Q.L. Li, M.L. Lu, T.T. Wang, H.Y. Yang, Q.Y. He, X.P. Cui, X.G. Li and S.Q. Zhao, *Microchim. Acta*, 2020, **187**, 675.
- 6 K. Ye, X.H. Niu, H.W. Song, L.J. Wang and Y.X. Peng, *Anal. Chim. Acta*, 2020, **1126**, 16-23.
- 7 Z.Q. Gao, K.C. Deng, X.D. Wang, M. Miro and D.P. Tang, *ACS Appl. Mater. Interfaces*, 2014, **6**, 18243-18250.
- 8 G. Kang, W.D. Liu, F.N. Liu, Z. Li, X.Y. Dong, C.X. Chen and Y.Z. Lu, *Chem. Eng. J.*, 2022, **449**, 137855.
- 9 M.L. Shi, Y. Cen, G.H. Xu, F.D. Wei, X.M. Xu, X. Cheng, Y.Y. Chai, M. Sohail and Q. Hu, *Anal. Chim. Acta*, 2019, **1077**, 225-231.
- 10 C. Yao, G.Q. Zhang, Y. Guan, T. Yang, R. Hu and Y.H. Yang, *Spectrochim. Acta A*, 2022, **280**, 121564.
- 11 S.Y. Liu and S. Pang, *Microchim. Acta*, 2018, **185**, 426.