Supporting information

Keratin-inorganic Hybrid Nanoflowers Decorated with Fe_3O_4 Nanoparticles as Enzyme Mimics for Colorimetric Detection of Glucose

Peiyu Li, Jing Zheng*, Jingli Xu, Min Zhang*

College of Chemistry and Chemical Engineering, Shanghai University of Engineering Science, Shanghai 201620, PR China
Email: kkzhengjing707@163.com (Jing Zheng); zhangmin@sues.edu.cn (Min Zhang).

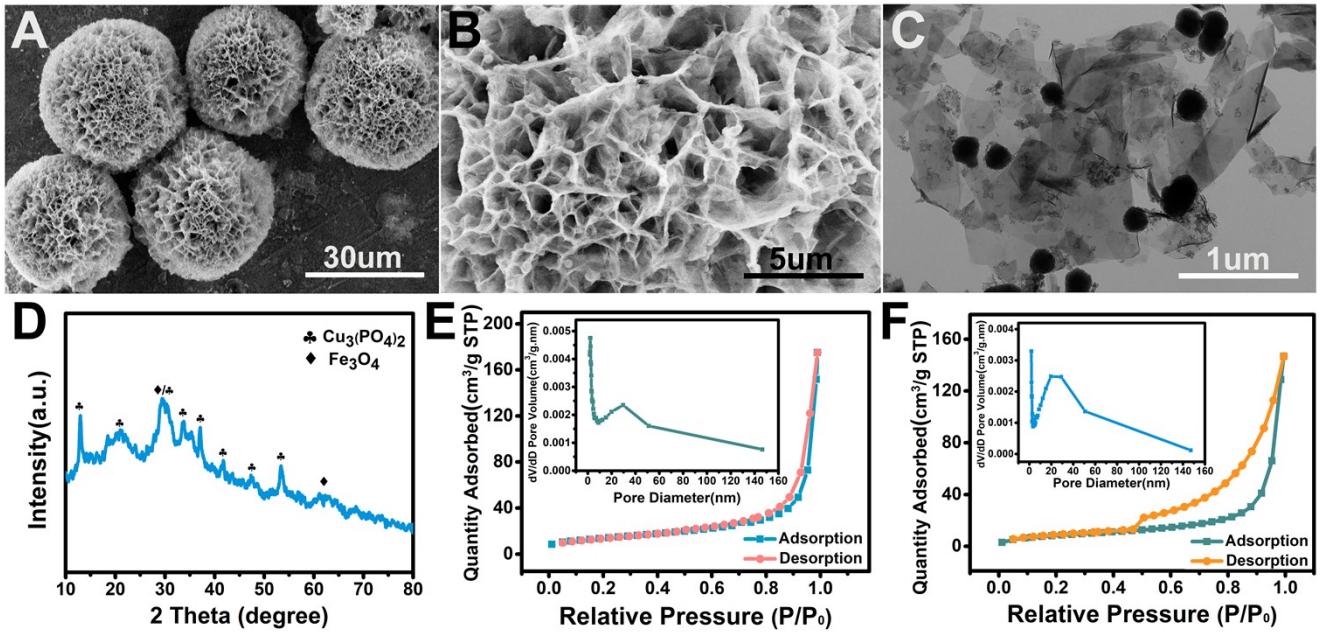

Fig. S1 (A, B, C) The SEM and TEM images of $Cu_3(PO_4)_2$@Fe_3O_4. (D) XRD patterns of $Cu_3(PO_4)_2$@Fe_3O_4. (E, F) Nitrogen absorption isotherms and pore size distribution for $Cu_3(PO_4)_2$@Fe_3O_4 and keratin-nanoflower.

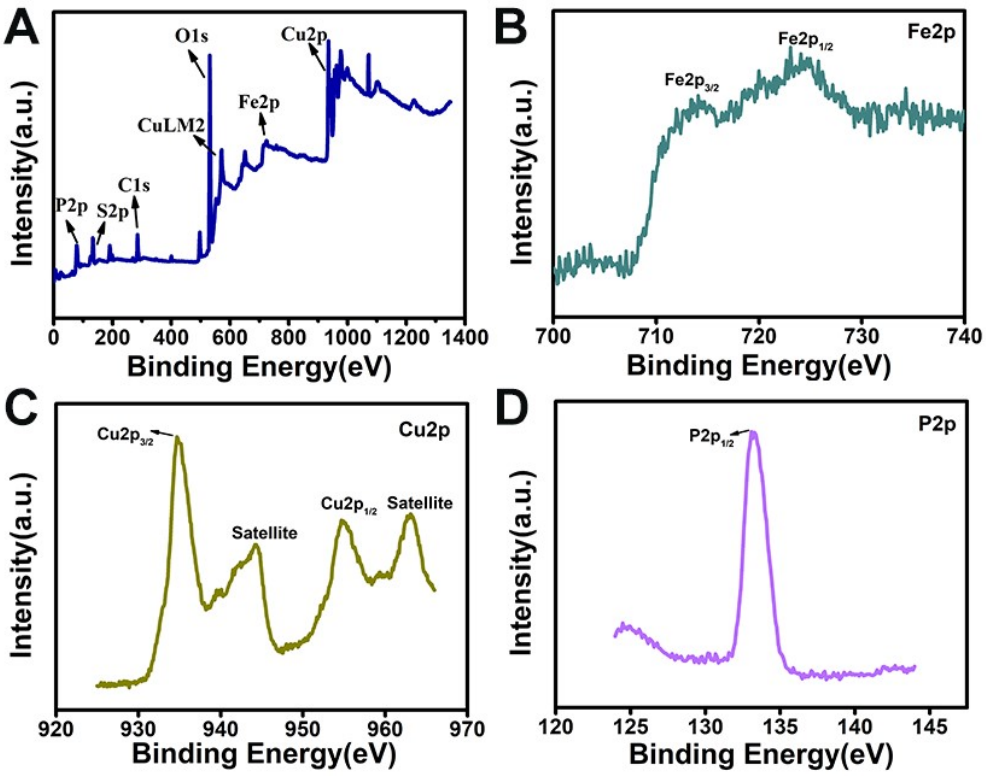

Fig. S2 XPS spectrum of keratin-nanoflower@Fe_3O_4: (A) survey, (B) Fe2p, (C) Cu2p, (D) P2p.

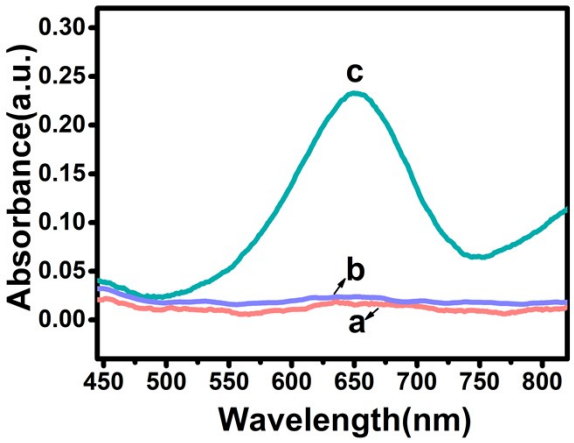

Fig. S3 UV-vis absorbance spectrum of (a) TMB, (b) H_2O_2, (c) oxTMB (Experiments were conducted by 0.2 mM TMB, 2.5 mM H_2O_2 and adding 2.5 mM H_2O_2 and 0.2 mM TMB in 370 μL of HAc-NaAc buffer (pH 3.0), respectively)

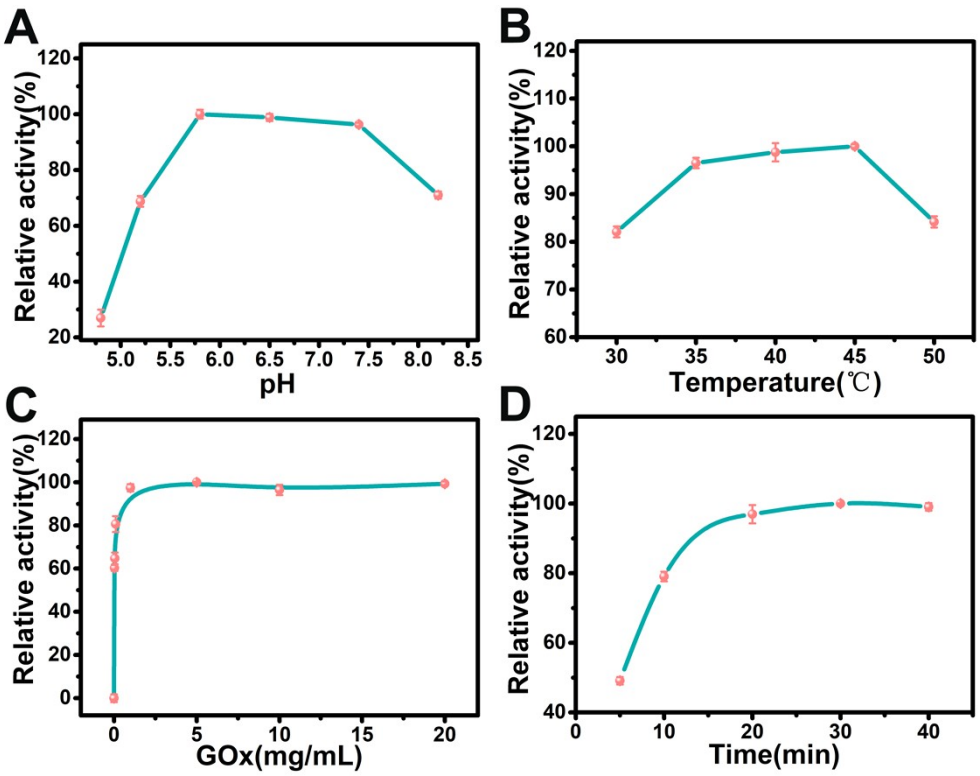

Fig. S4 Glucose catalytic reaction under different reaction conditions. (A) varied pH values (4.8-8.2). (B) varied temperature (30-50 ºC). (C) varied amounts of glucose oxidase (0-20.0 mg·mL^{-1}). (D) varied reaction time (5-40 min). The reaction system consists of 0.2 mM TMB as substrates. Error bars indicate standard deviations from three repeated assays.

Table S1 Comparison of the apparent kinetic parameters of varied enzyme mimics and HRP.

Enzyme mimics	K_m (mM)		V_{max} (10^{-8} s^{-1})		Reference
	H_2O_2	TMB	H_2O_2	TMB	
HRP	3.7	0.434	8.71	10	[1]
Fe_3O_4 MNPs	0.43	0.71	13.08	5.31	[2]
Fe_3O_4@C YSNs	0.035	0.27	3.34	12.0	[3]
Fe_3O_4 /CoFe-LDH	10.24	0.395	-	-	[4]
Nanoflower@Ag_3PO_4	0.0155	0.294	1.966	3.962	[5]
Fe_3O_4@CeO_2 NCs	1.13	0.15	12.5	0.64	[6]
PB/γ-Fe_2O_3 MNPs	323.6	0.307	117	106	[7]
$ZnFe_2O_4$ MNPs	1.66	0.85	0.774	1.331	[8]
Keratin-nanoflower@Fe_3O_4	0.0156	0.2982	2.65	6.406	This work

Table S2 Comparison of different nanozymes for glucose detection.

Catalysts	Linear range (μM)	Detection limit (μM)	Reference
Fe_3O_4@C YSNs	1-10	1.12	[3]
Fe_3O_4 MNs	50-1000	30	[9]
Fe-doped CeO_2	1-100	3.41	[10]
Fe@PCN-224	30-800	22	[11]
PDI-Co_3O_4	5-100	2.77	[12]
PtO_2 nanoparticles	50-1500	10.8	[13]
GOx–$Fe_3(PO_4)_2{\cdot}8H_2O$ HNFs	10-20000	0.1	[14]
NL-$MnCaO_2$	183-421	23.86	[15]
MoO_3@C	20-6000	10	[16]
H_2TCPP-Fe_3O_4	5-25	2.21	[17]
$NiCo_2S_4$	20-1000	8.24	[18]
Peptide/Au NPs	100-20000	40	[19]
BSA-PtNP@$MnCo_2O_4$	10-120	8	[20]
Keratin-nanoflower@Fe_3O_4	5-230	2.01	This work

References

1. Y. Wang, L. Xu and W. Xie, *Microchemical Journal*, 2019, **147**, 75-82.
2. M. Ma, J. Xie, Y. Zhang, Z. Chen and N. Gu, *Materials Letters*, 2013, **105**, 36-39.
3. N. Lu, M. Zhang, L. Ding, J. Zheng, C. Zeng, Y. Wen, G. Liu, A. Aldalbahi, J. Shi, S. Song, X. Zuo and L. Wang, *Nanoscale*, 2017, **9**, 4508-4515.
4. W. Yang, J. Li, M. Wang, X. Sun, Y. Liu, J. Yang and D. H. L. Ng, *Colloids Surf B Biointerfaces*, 2020, **188**, 110742.
5. T. Cao, J. Zheng, J. Xu, N. S. Alharbi, T. Hayatcd and M. Zhang, *New J. Chem*, 2019, **43**, 15946-15955.
6. F. Huang, J. Wang, W. Chen, Y. Wan, X. Wang, N. Cai, J. Liu and F. Yu, *Journal of the Taiwan Institute of Chemical Engineers*, 2018, **83**, 40-49.
7. Z. Yang, F. Ma, Y. Zhu, S. Chen, C. Wang and X. Lu, *Dalton Trans*, 2017, **46**, 11171-11179.
8. L. Su, J. Feng, X. Zhou, C. Ren, H. Li and X. Chen, *Anal Chem*, 2012, **84**, 5753-5758.
9. H. Wei and E. Wang, *Anal Chem*, 2008, **80**, 2250-2254.
10. D. Jampaiah, T. Srinivasa Reddy, A. E. Kandjani, P. R. Selvakannan, Y. M. Sabri, V. E. Coyle, R. Shukla and S. K. Bhargava, *J Mater Chem B*, 2016, **4**, 3874-3885.
11. T. Li, P. Hu, J. Li, P. Huang, W. Tong and C. Gao, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 2019, **577**, 456-463.
12. Y. Ding, M. Chen, K. Wu, M. Chen, L. Sun, Z. Liu, Z. Shi and Q. Liu, *Mater Sci Eng C Mater Biol Appl*, 2017, **80**, 558-565.
13. X. Liu, Y. Zhou, J. Liu and H. Xia, *Spectrochim Acta A Mol Biomol Spectrosc*, 2021, **248**, 119280.
14. J. Guo, Y. Wang and M. Zhao, *Sensors and Actuators B: Chemical*, 2019, **284**, 45-54.
15. S. Rashtbari, G. Dehghan and M. Amini, *Anal Chim Acta*, 2020, **1110**, 98-108.
16. H. Ren, L. Yan, M. Liu, Y. Wang, X. Liu, C. Liu, K. Liu, L. Zeng and A. Liu, *Sensors and Actuators B: Chemical*, 2019, **296**, 126517.
17. Q. Liu, H. Li, Q. Zhao, R. Zhu, Y. Yang, Q. Jia, B. Bian and L. Zhuo, *Mater Sci Eng C Mater Biol Appl*, 2014, **41**, 142-151.
18. Z. Huang, W. He, H. Shen, G. Han, H. Wang, P. Su, J. Song and Y. Yang, *Talanta*, 2021, **230**, 122337.
19. X. Wu, J. Yin, J. Liu, Y. Gu, S. Wang and J. Wang, *Analyst*, 2020, **145**, 7234-7241.
20. M. Liu, J. Mou, X. Xu, F. Zhang, J. Xia and Z. Wang, *Talanta*, 2020, **220**, 121374.