

Supporting Information

Single Au@MnO₂ nanoparticle imaging for sensitive glucose detection based on etching of MnO₂ by H₂O₂

Weizhen Xu,^a Min Ouyang,^a Hongmei Luo,^a Dong Xu^{*a} and Qinlu Lin^{*a}

^a National Engineering Laboratory for Rice and By-products Further Processing, College of Food Science and Engineering, Central South University of Forestry & Technology, Changsha, 410004, China

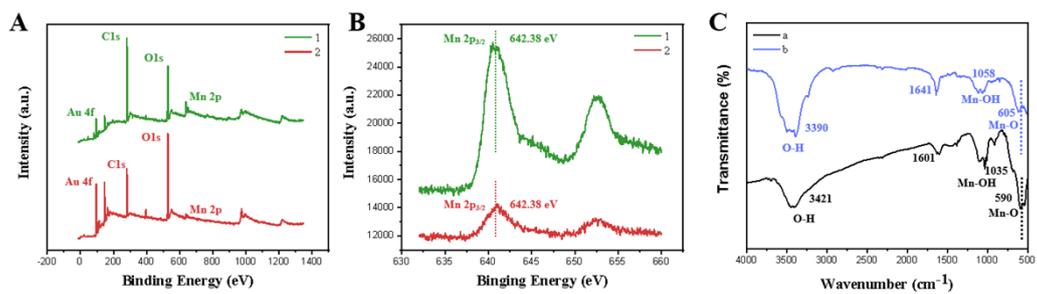


Fig. S1 XPS survey spectra of Au@MnO₂ nanoparticles before (1) and after (2) incubation with H₂O₂. (A) Full spectra and (B) Mn 2p. (C) FTIR spectra of pure MnO₂ powder (a) and Au@MnO₂ nanoparticles (b).

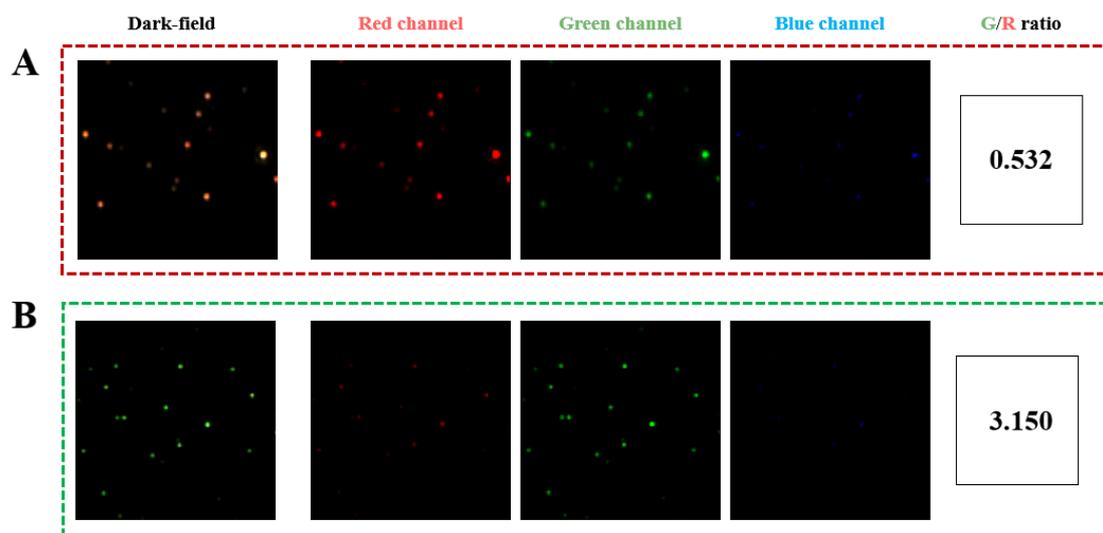


Fig. S2 (A) DFM images of Au@MnO₂ nanoparticles and their separate red, green and blue channels. (B) DFM images of Au@MnO₂ nanoparticles incubation with glucose and GOx, and their separate red, green and blue channels. G/R ratio reflected the change to a large extent.

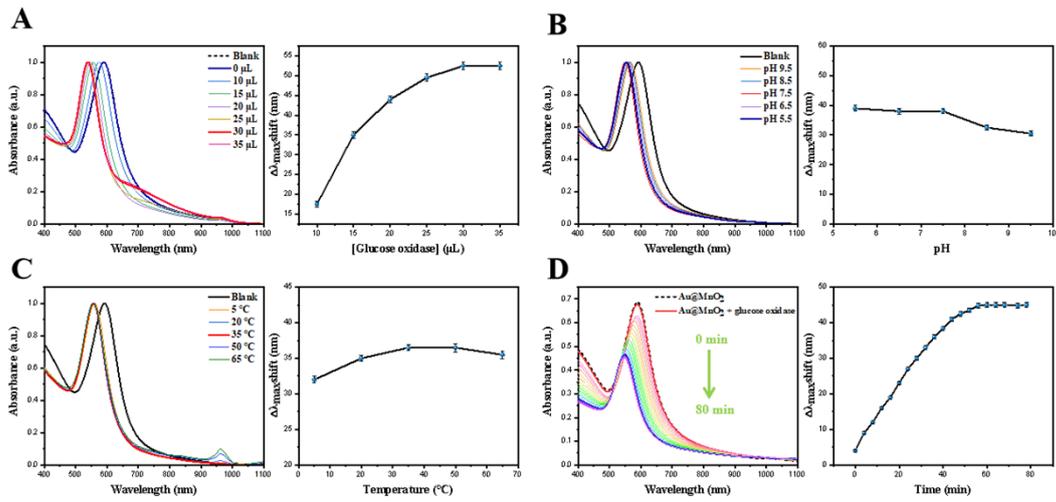


Fig. S3 Optimization for reaction conditions. UV-Vis absorption spectra and the corresponding $\Delta\lambda_{\text{max}}$ shift of Au@MnO₂ nanoparticles under different conditions. (A) GOx concentrations, (B) pH, (C) temperatures, and (D) reaction time.

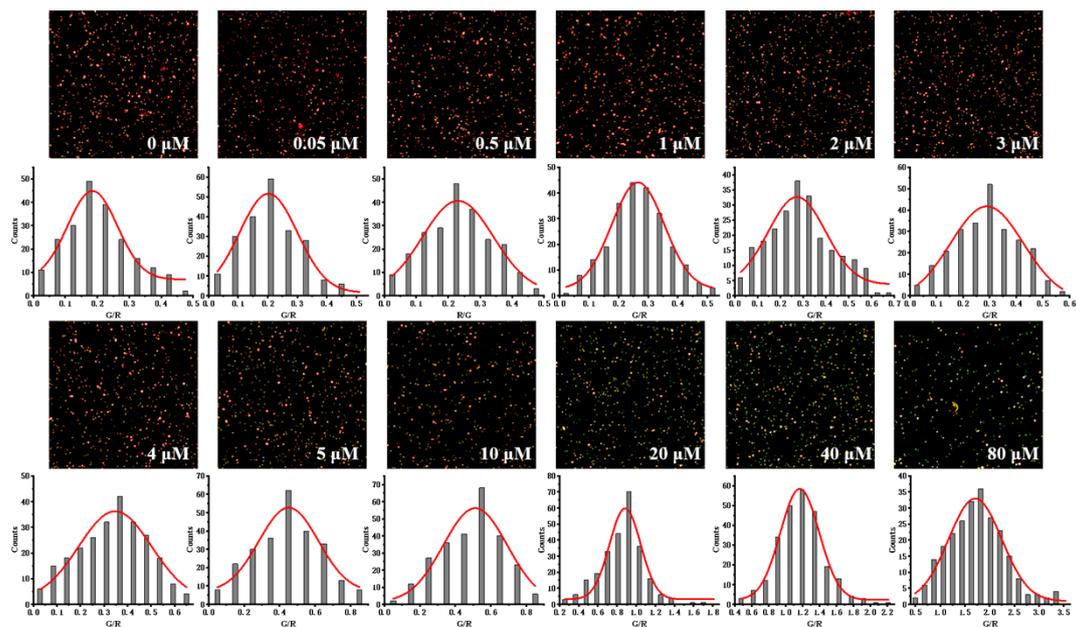


Fig. S4 DFM images of Au@MnO₂ nanoparticles and the corresponding Gaussian fitting of G/R ratio in the presence of different glucose concentrations over the range of 0-80 μM.

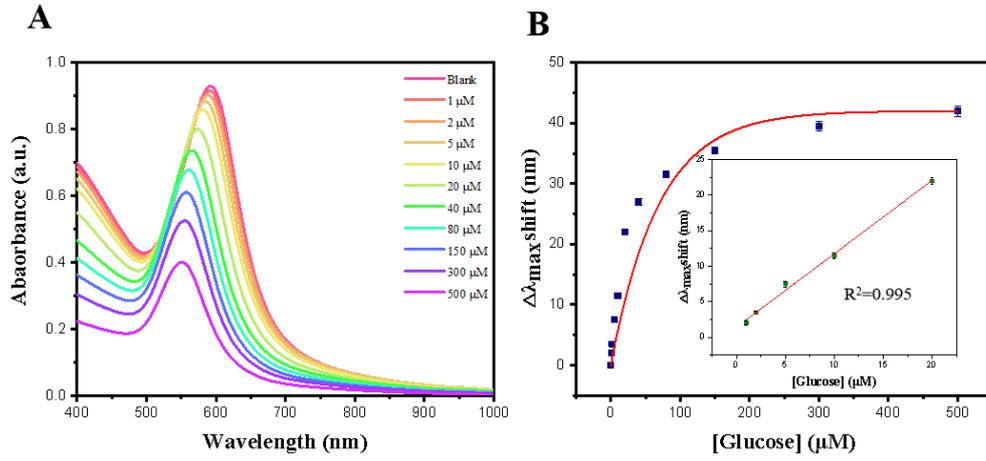


Fig. S5 (A) UV-Vis spectra of Au@MnO₂ NPs solution in the presence of different concentrations of glucose solutions (1, 2, 5, 10, 40, 80, 150, 300 and 500 μM). (B) Dynamic range and linear range of $\Delta\lambda_{\text{max}}$ shift (nm) of Au@MnO₂ NPs at different glucose concentrations. GOx (0.2 mg/mL): 30 μl, temperature: 35 °C, and reaction time: 50 min.

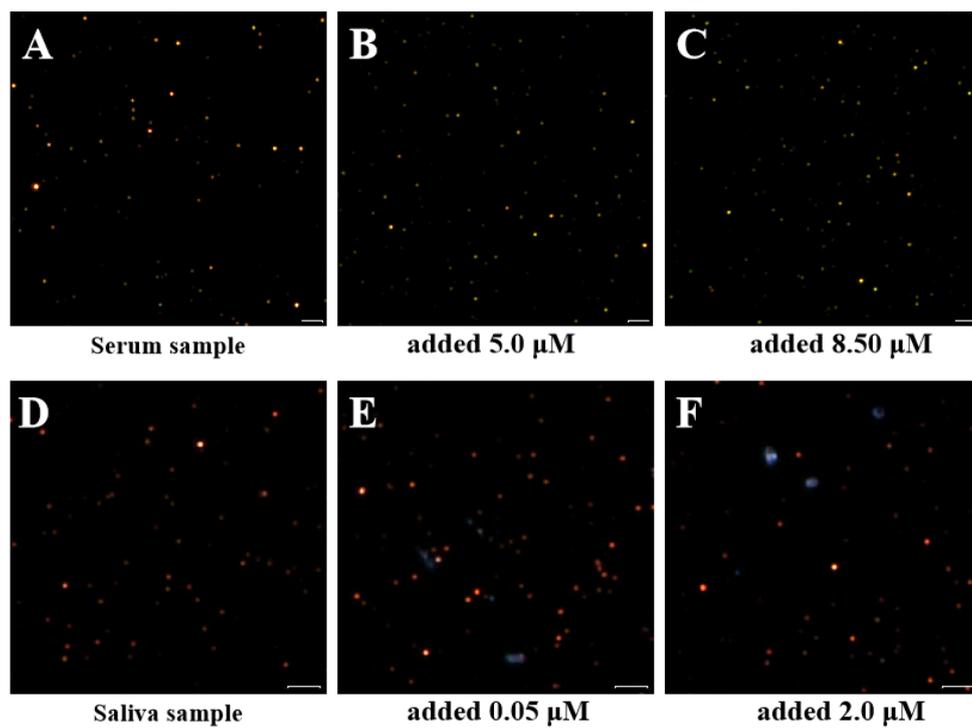


Fig. S6 (A-C) Representative DFM images of the recovery assay in the human serum and (D-F) saliva samples spiked with different concentrations of glucose.

Table 1. Comparison of various glucose sensing systems.

Method	Linear range (μM)	LOD (μM)	Ref
fluorescence	5-1000	2.11	(Wang et al., 2019)
fluorescence	0.8-50	0.11	(Zhou et al., 2021)
colorimetry	0.5-400	0.17	(Chen et al., 2014)
colorimetry	18.3-421.6	23.86	(Rashtbari et al., 2020)
colorimetry	0-4000	5.0	(Qian et al., 2021)
colorimetry	10-500	3.66	(Hong et al., 2021)
Single nanoparticle color imaging	0.05-20.0	0.0129	this work