Supporting Information For

A colorimetric biosensor based on enzyme-catalysis-induced production of inorganic nanoparticles for sensitive detection of glucose in white grape wine

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Experimental

Optimization of reaction parameters

For effects of pH, the MES solution pH was adjusted with HCl (12 M) and KOH (12 M). The mixture of 0.25 mM $FeCl_3$, 0.25 mM $K_3Fe(CN)_6$, 0.05 mg mL^{-1} GOx, and 1 mM glucose in 50 mM MES solution (pH 1.0 - pH 7.0) after 10 min was prepared. Then, the absorbance of the solution was measured at a wavelength of 706 nm against a blank without glucose.

For effects of GOx concentration, the mixture of 0.25 mM $FeCl_3$, 0.25 mM $K_3Fe(CN)_6$, and 1 mM glucose in 50 mM MES (pH 3.0) with different concentrations of GOx after 10 min was prepared. Then, the absorbance of the solution was measured at 706 nm.

For effects of the molar ratio Fe^{3+} versus $Fe(CN)_6^{3-}$, the total volume of 0.5 mM $FeCl_3$ and 0.5 mM $K_3Fe(CN)_6$ were 200 µL while the volume ratio of two solutions varied from 0 to 19 in 50 mM MES (pH 3.0). 10 µL of 1.1 mg mL^{-1} GOx and 22 mM glucose was added in succession. Then, the absorbance of the solution was measured at 706 nm after 10 min.

For effects of $FeCl_3$/$K_3Fe(CN)_6$ concentration, 0.05 mg mL^{-1} GOx, and 1 mM glucose in 50 mM MES (pH 3.0) with different concentrations of $FeCl_3$/ $K_3Fe(CN)_6$ was prepared. Then, the absorbance of the solution was measured at 706 nm after 10 min.

For effects of reaction time, 0.75 mM $FeCl_3$, 0.75 mM $K_3Fe(CN)_6$, 0.05 mg mL^{-1} GOx, and 1 mM glucose in 50 mM MES (pH 3.0) was prepared. Then, the absorbance of the solution was monitored every two minutes for 24 minutes at 706 nm.

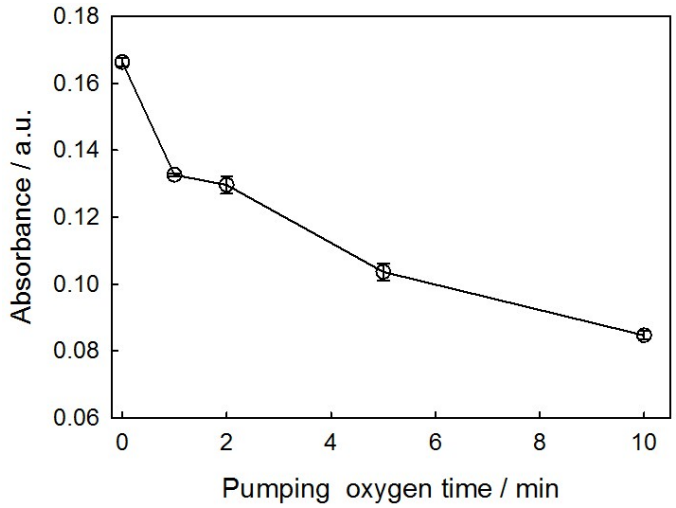

Fig. S1. The effects of oxygen on the absorbance of PBNPs. Reaction conditions: 0.25 mM $FeCl_3$, 0.25 mM $K_3Fe(CN)_6$, 0.05 mg mL^{-1} GOx, and 1 mM glucose in 50 mM MES (pH3.0) at 25 ^oC, reaction for 10 min.

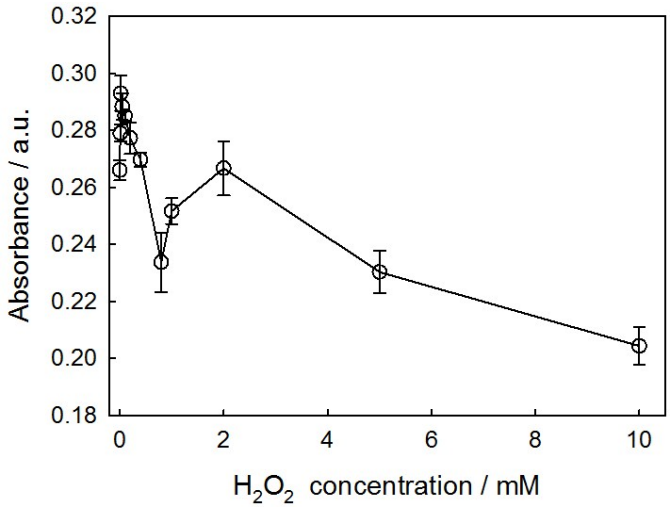

Fig. S2. The effects of H_2O_2 concentration on the absorbance of PBNPs. Reaction conditions: 0.25 mM $FeCl_2$, 0.25 mM $K_3Fe(CN)_6$, in 50 mM MES (pH3.0) at 25 ^oC, reaction for 10 min.

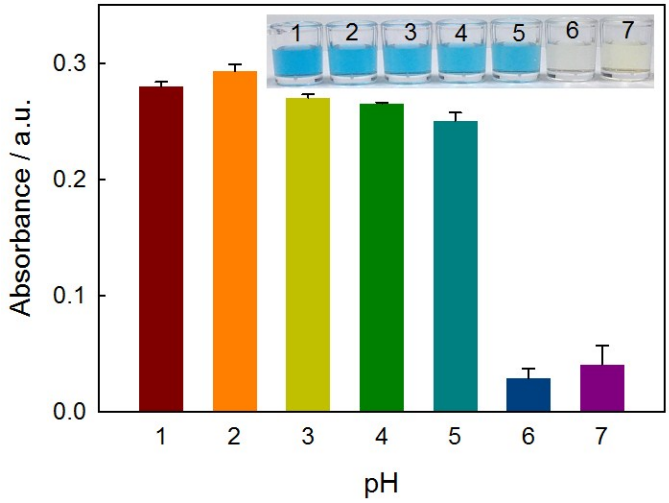

Fig. S3. The effects of pH on the absorbance of PBNPs. Reaction conditions: 0.25 mM $FeCl_2$, 0.25 mM $K_3Fe(CN)_6$, in 50 mM MES (pH 1.0 - pH 7.0) at 25 ^oC, reaction for 10 min.

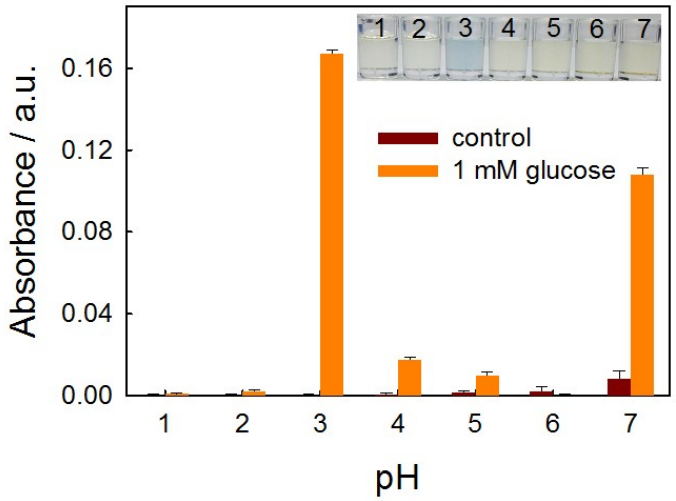

Fig. S4. The effects of pH on the absorbance of PBNPs. Reaction conditions: 0.25 mM $FeCl_3$, 0.25 mM $K_3Fe(CN)_6$, 0.05 mg mL^{-1} GOx, and 1 mM glucose in 50 mM MES (pH 1.0 - pH 7.0) at 25 ^oC, reaction for 10 min. The control means the system without glucose.

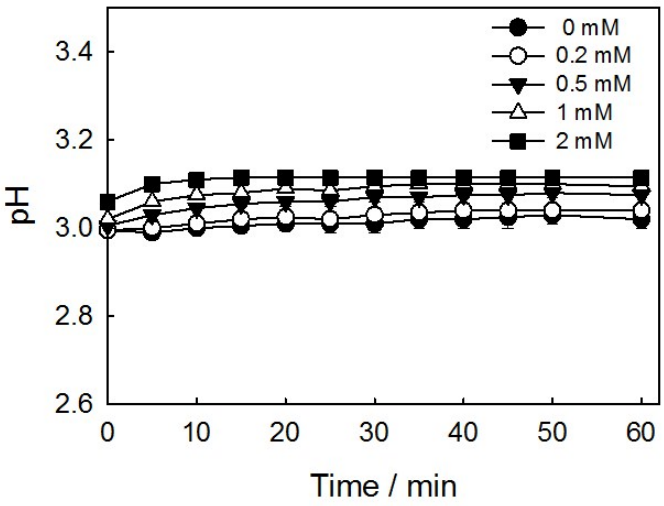

Fig. S5. The pH of the solution during the experiments. Reaction conditions: 0.25 mM $FeCl_3$, 0.25 mM $K_3Fe(CN)_6$, 0.05 mg mL^{-1} GOx, and different concentrations of glucose in 50 mM MES (pH 3.0) at 25 ^oC.

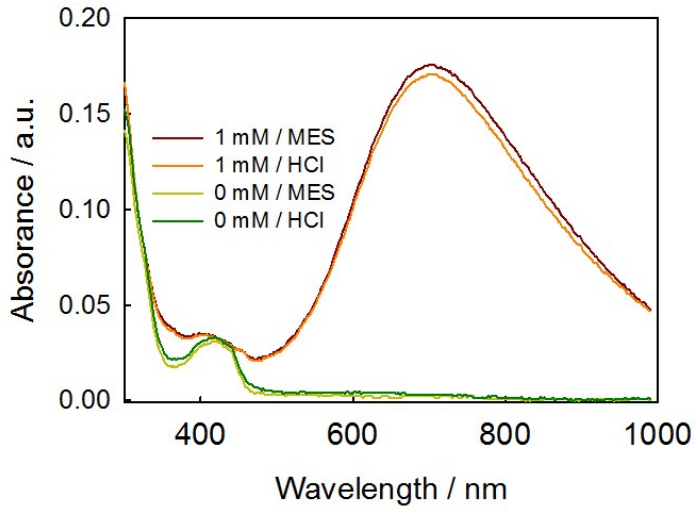

Fig. S6. The effects of medium on the absorbance of PBNPs. Reaction conditions: 0.25 mM $FeCl_3$, 0.25 mM $K_3Fe(CN)_6$, 0.05 mg mL^{-1} GOx, and 1 mM glucose in 50 mM MES and hydrochloric acid (pH 3.0) at 25 ^oC, reaction for 10 min.

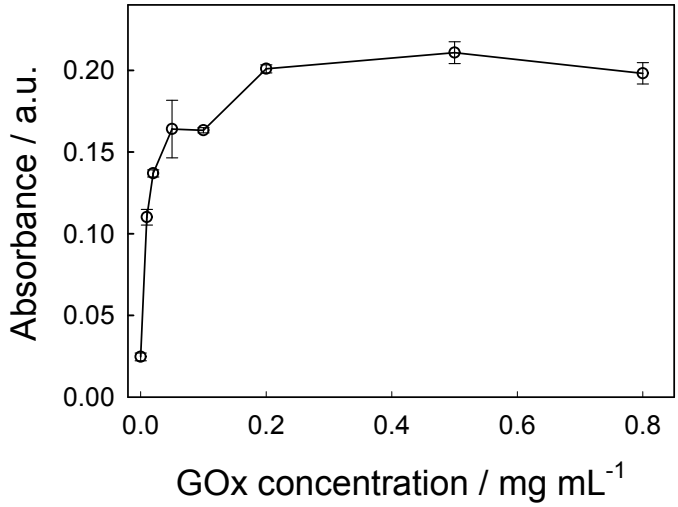

Fig. S7. Effects of GOx concentration on the formation of PBNPs. Reaction conditions: 0.25 mM $FeCl_3$, 0.25 mM $K_3Fe(CN)_6$, and 1 mM glucose in 50 mM MES (pH 3.0) at 25 ^oC, reaction for 10 min.

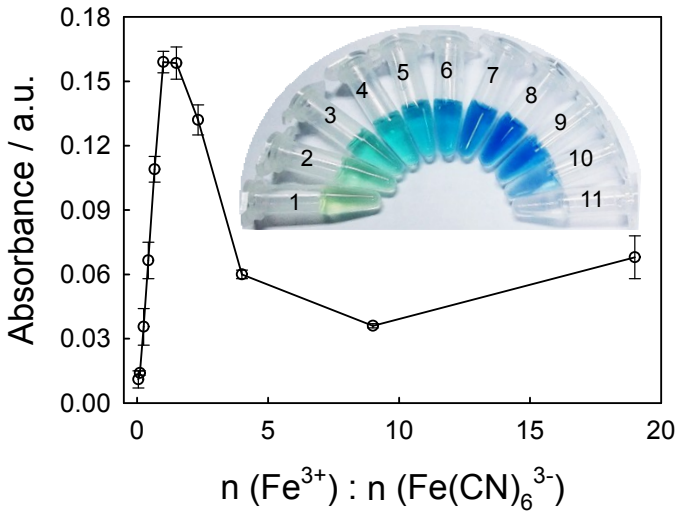

Fig. S8. Effects of the molar ratio of $FeCl_3$ to $K_3Fe(CN)_6$ and digital image (inset). The molar ratio arranged from 0 to 19 (1 to 11). Reaction conditions: 0.05 mg mL^{-1} GOx, and 1 mM glucose in 50 mM MES (pH 3.0) at 25 ^oC, reaction for 10 min.

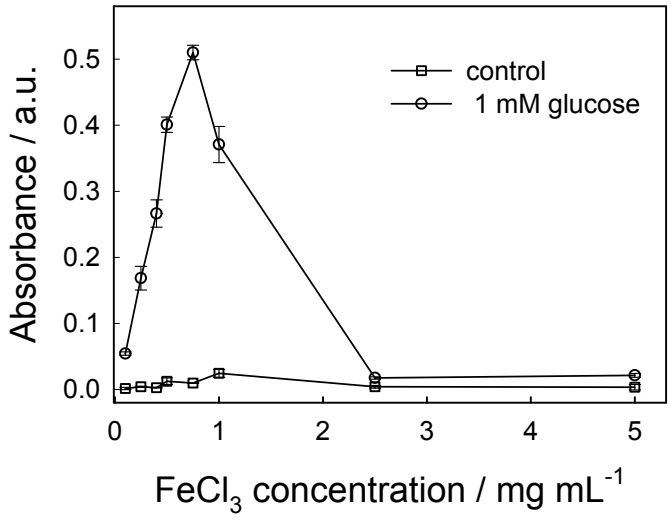

Fig. S9. Effects of $FeCl_3$ concentration on the formation of PBNPs. Reaction conditions: 0.05 mg mL^{-1} GOx, and 1 mM glucose in 50 mM MES (pH 3.0) at 25 ^{o}C, reaction for 10 min.

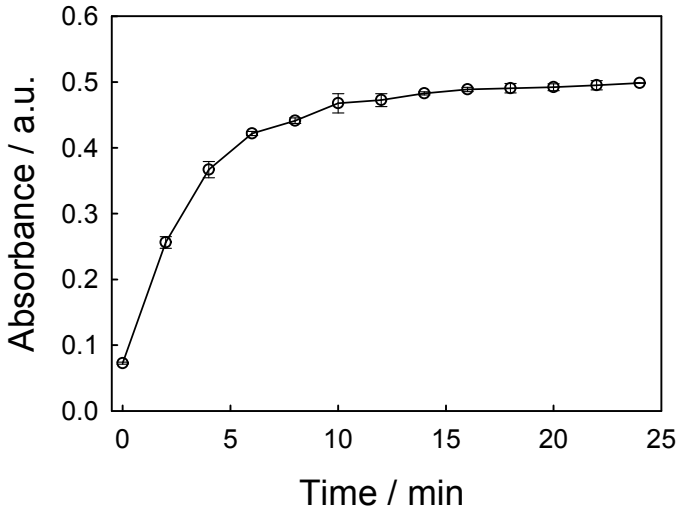

Fig. S10. Absorbance changes of PBNPs in a function of time at the wavelength of 706 nm. Reaction conditions: 0.75 mM $FeCl_3$, 0.75 mM $K_3Fe(CN)_6$, 0.05 mg mL^{-1} GOx, and 1 mM glucose in 50 mM MES (pH 3.0) at 25 ^oC.

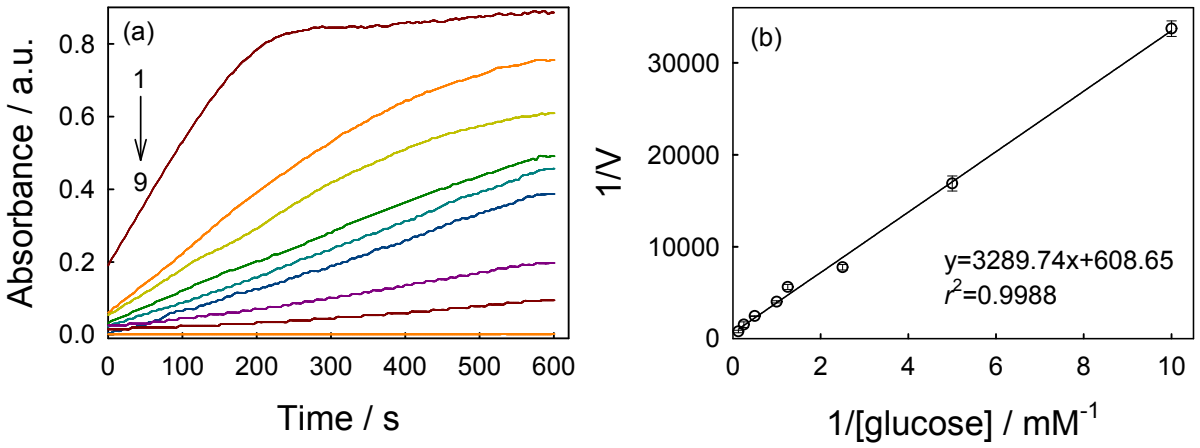

Fig. S11. UV-vis spectra (a) of 0.02 mg mL^{-1} GOx to the addition of different concentrations of glucose in the presence of 0.75 mM $FeCl_3$ and 0.75 mM $K_3Fe(CN)_6$ in 50 mM MES (pH 3.0). Glucose concentrations (all in mM) from top to bottom (1 to 9): 8, 4, 2, 1, 0.8, 0.4, 0.2, 0.1, 0. Lineweaver-Burk plot (b) is also given.

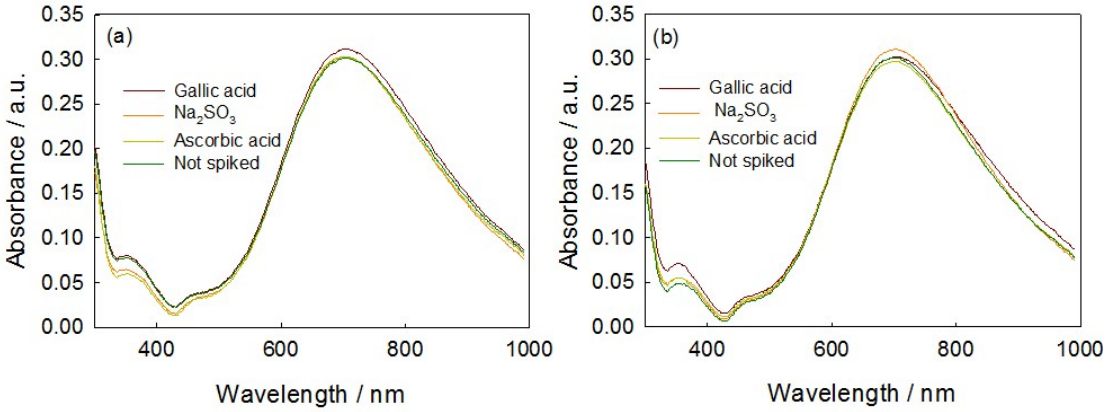

Fig. S12. UV-vis spectra for the detection of glucose in sweet wine (a) and half sweet wine (b) with or without spiked reductants (sulfite, gallic acid and ascorbic acid) in 50 mM MES (pH 3.0) at 25 ^{o}C. Concentrations: 0.75 mM $FeCl_3$, 0.75 mM $K_3Fe(CN)_6$, 0.05 mg mL^{-1} GOx, 196.8 mg L^{-1} Na_2SO_3, 500 mg L^{-1} gallic acid, 12 mg L^{-1} ascorbic acid. Reaction time: 10 min.