Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information

Humic acid assisted synthesis of stable copper nanoparticles as peroxidase mimetic and their application in glucose detection

Nan Wang, Bingchen Li, Fengmin Qiao, Jianchao Sun, Hai Fan*, Shiyun Ai*

College of Chemistry and Material Science, Shandong Agricultural University, Taian, 271018, Shandong, PR China

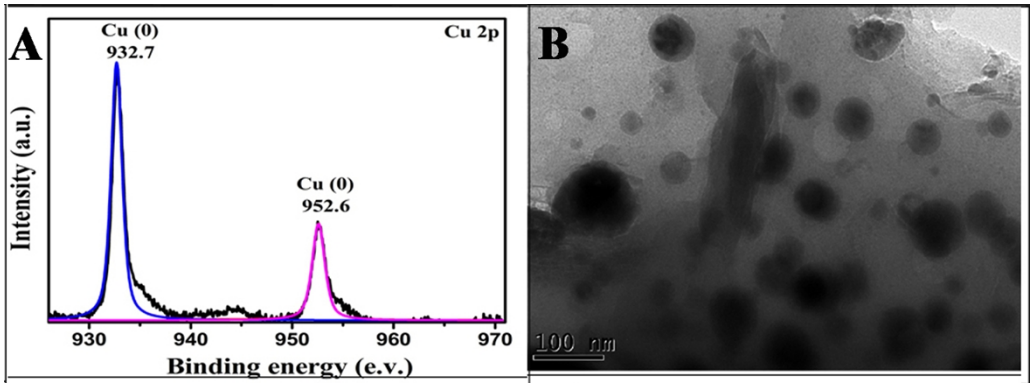

Fig. S1 (A) XPS image of Cu NPs, (B) TEM image of Cu NPs.

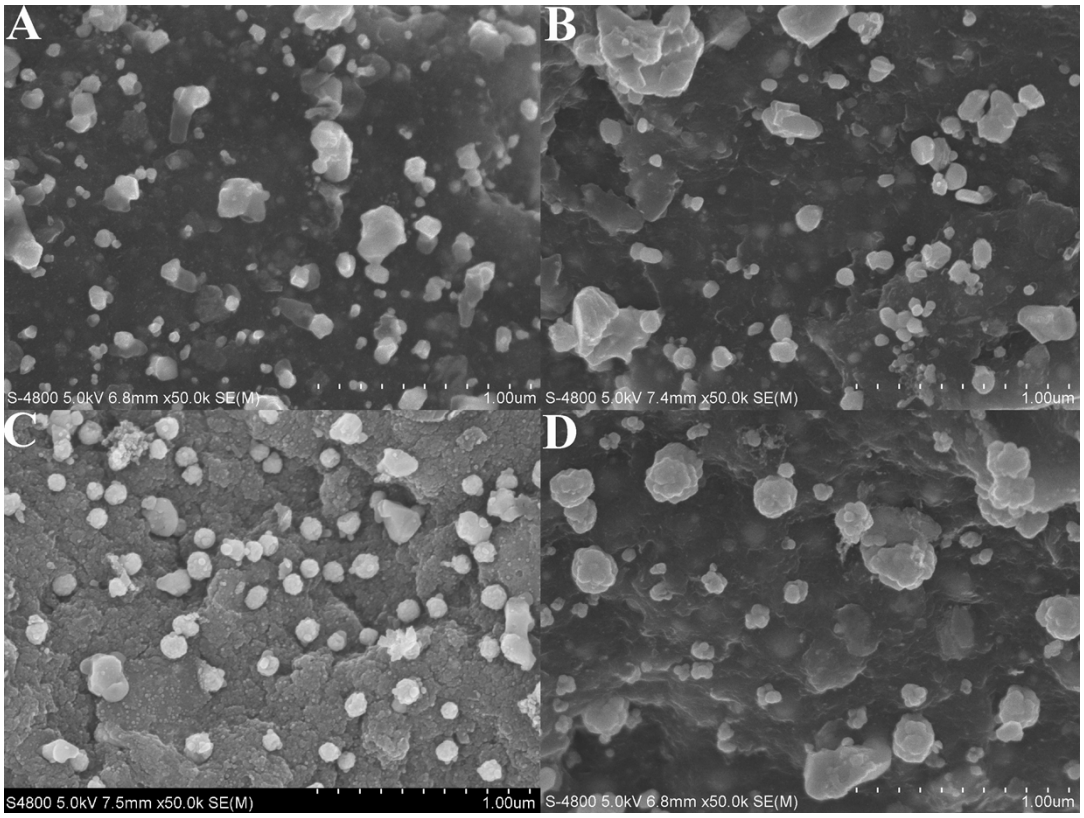

Fig. S2 The FESEM images of Cu NPs obtained by the different mass ratios of copper acetate and humic acid (HA) (A: 1:2.5, B: 2.5:2.5, C: 5:2.5, D: 7.5:2.5).

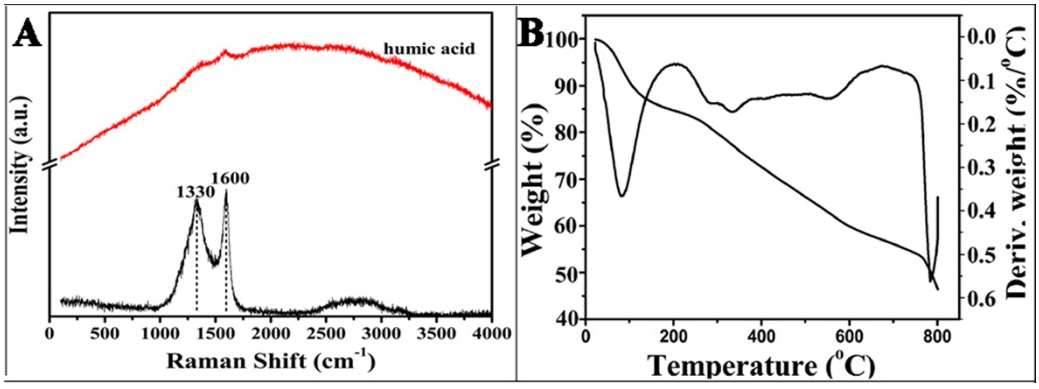

Fig. S3 (A) Raman spectra of humic acid and Cu NPs, (B) TGA spectra of humic acid.

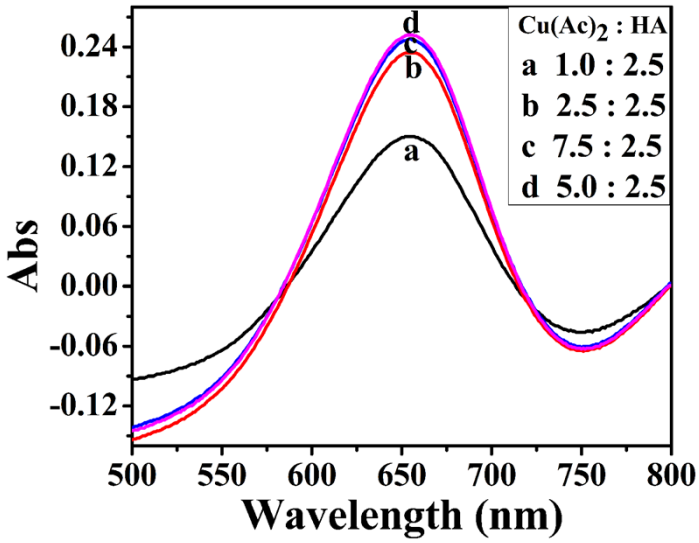

Fig. S4 Absorbance spectrum of TMB (800 μM) using Cu NPs obtained at different mass ratios of copper acetate and humic acid. Solutions in 100 mM PBS (pH 3.0) incubated with Cu NPs at room temperature for 10 min.

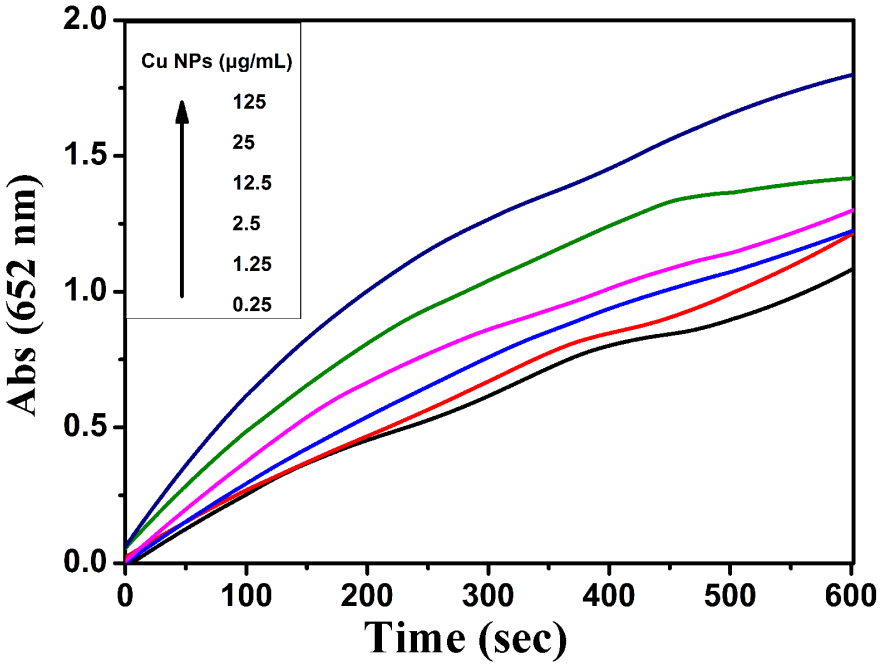

Fig. S5 Time-dependent absorbance changes at 652 nm of 800 μM TMB reaction solutions in the absence or presence of different doses of Cu NPs in 25 mM PBS (pH 3.0) at the room temperature. The concentration of H_2O_2 was 25 mM.

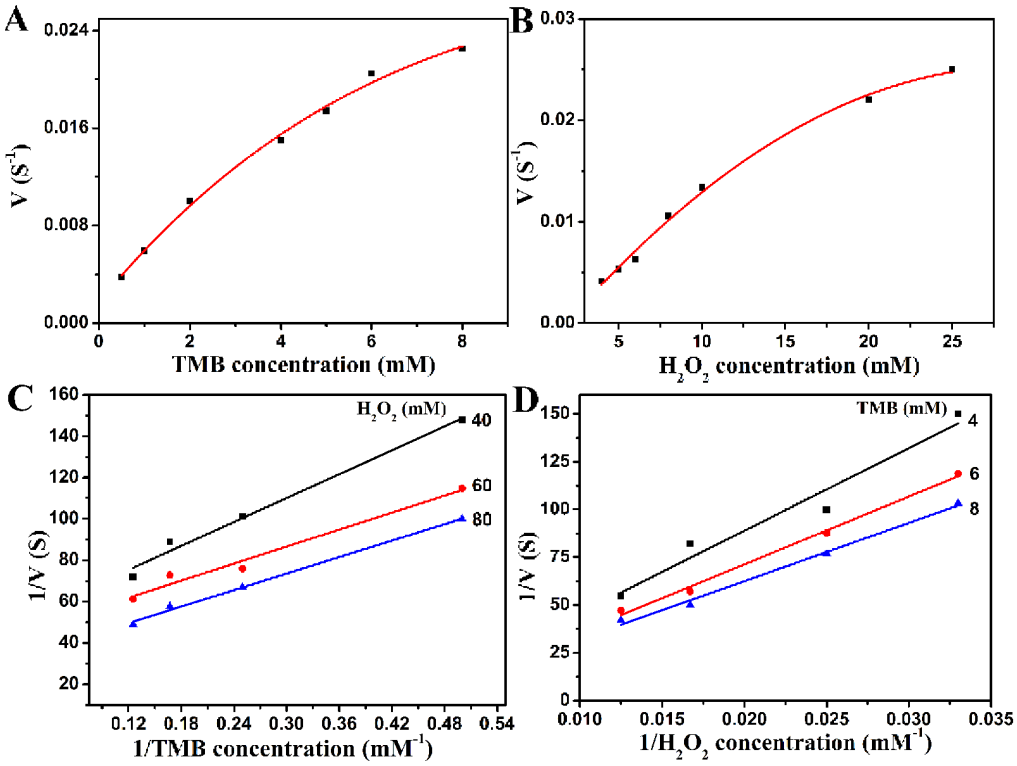

Fig. S6 Steady-state kinetic assay and catalytic mechanism of Cu NPs. (A) The concentration of H_2O_2 was 80 mM and TMB concentration was varied. (B) The concentration of TMB was 8 mM and H_2O_2 concentration was varied. (C or D) Double reciprocal plots of activity of Cu NPs with the concentration of one substrate (H_2O_2 or TMB) fixed and the other varied. The velocity (v) of the reaction was measured using 0.25 mg·mL^{-1} Cu NPs in 400 μL of 25 mM PBS (pH 3.0) at the room temperature.

Table S1 Comparison of the apparent Michaelis-Menten constant (K_m) and maximum reaction rate (V_{max}) between Cu NPs and Au NPs/PVP-GNs.

catalyst	substance	K_m [mM]	V_{max} (10^{-8} M s^{-1})
Cu NPs	TMB	1.047	3.97
Cu NPs	H_2O_2	31.265	26.4
Au NPs/PVP-GNs[1]	TMB	2.63	13.04
Au NPs/PVP-GNs[1]	H_2O_2	104	11.98

Table S2 Comparison of detection limits for different glucose sensors.

catalyst	Linear range (mM)	Detection limit (M)	reference
Cu NPs	0.001-0.1	6.86×10^{-7}	/
Au NPs	0.02-5.7	8.2×10^{-6}	[2]
Pt NPs/Polyaniline	0.01-8	7×10^{-7}	[3]
Ag NPs-graphene	2-10	1×10^{-4}	[4]

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