Supporting Information

A facile route for constructing Cu-N-C peroxidase mimics

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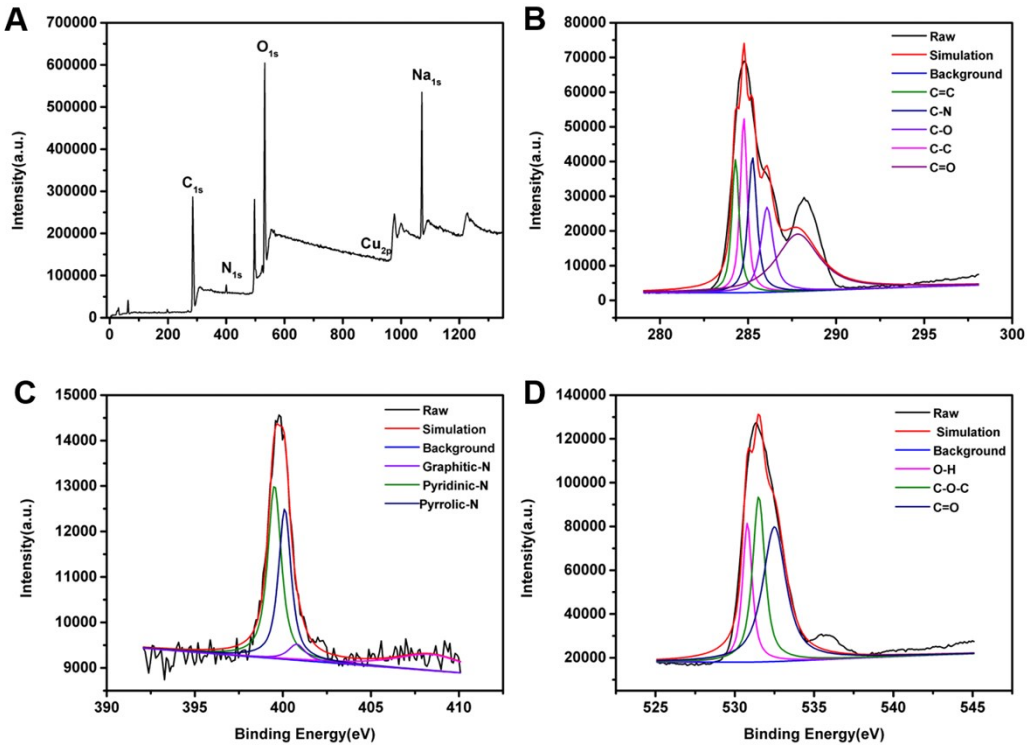

Figure S1 X-ray photoelectron spectra of Cu-N-C SAzymes: (A) full survey spectrum, high-resolution (B) C 1s, (C) N 1s, (D) O 1s, (E) Cu 2p, and (F) Na 1s.

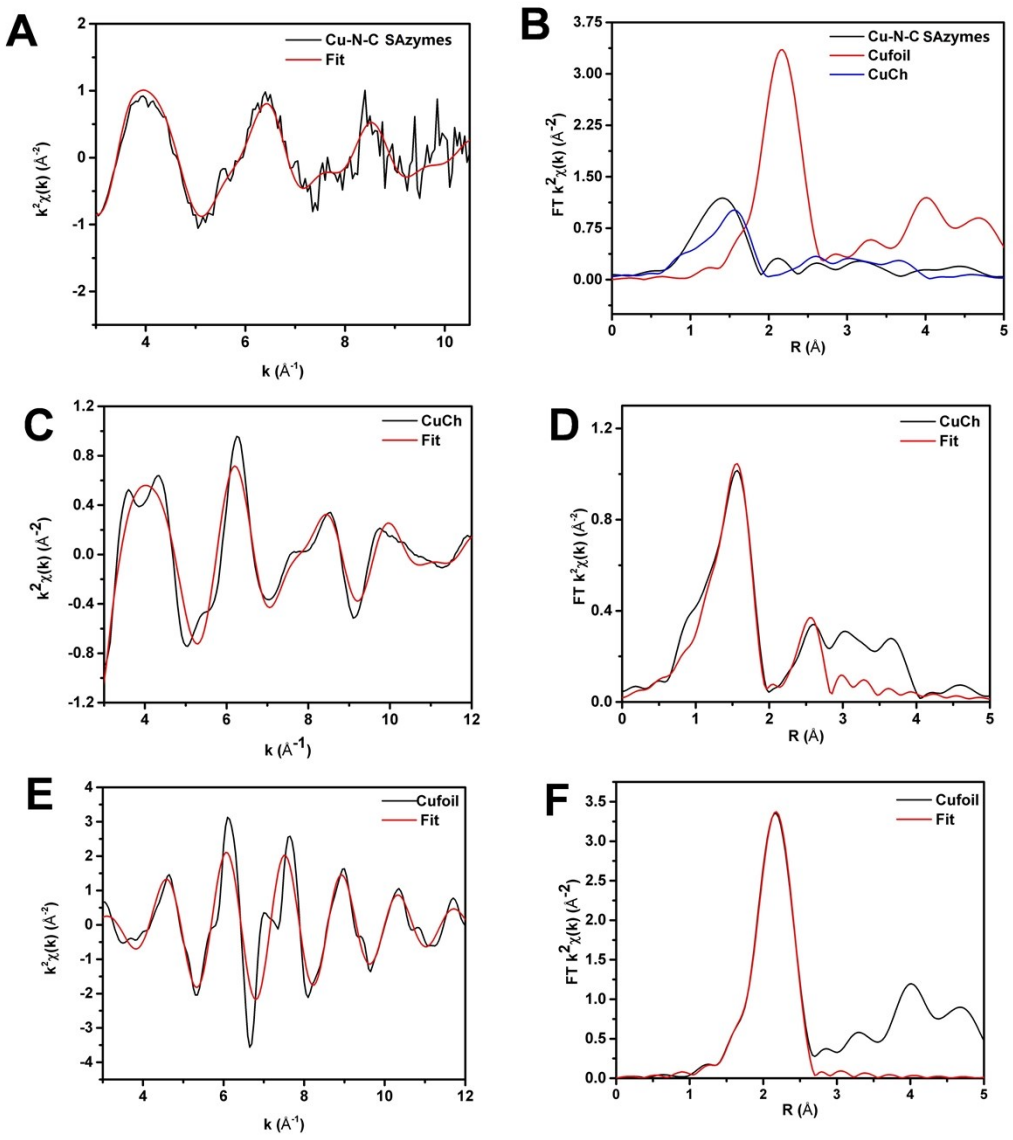

Figure S2 The k^2-weighted EXAFS fitting curves in k-space and their Fourier transforms in the R domain of (A-B) Cu-N-C SAzymes, (C-D) Cu foil, and (E-F) CuCh.

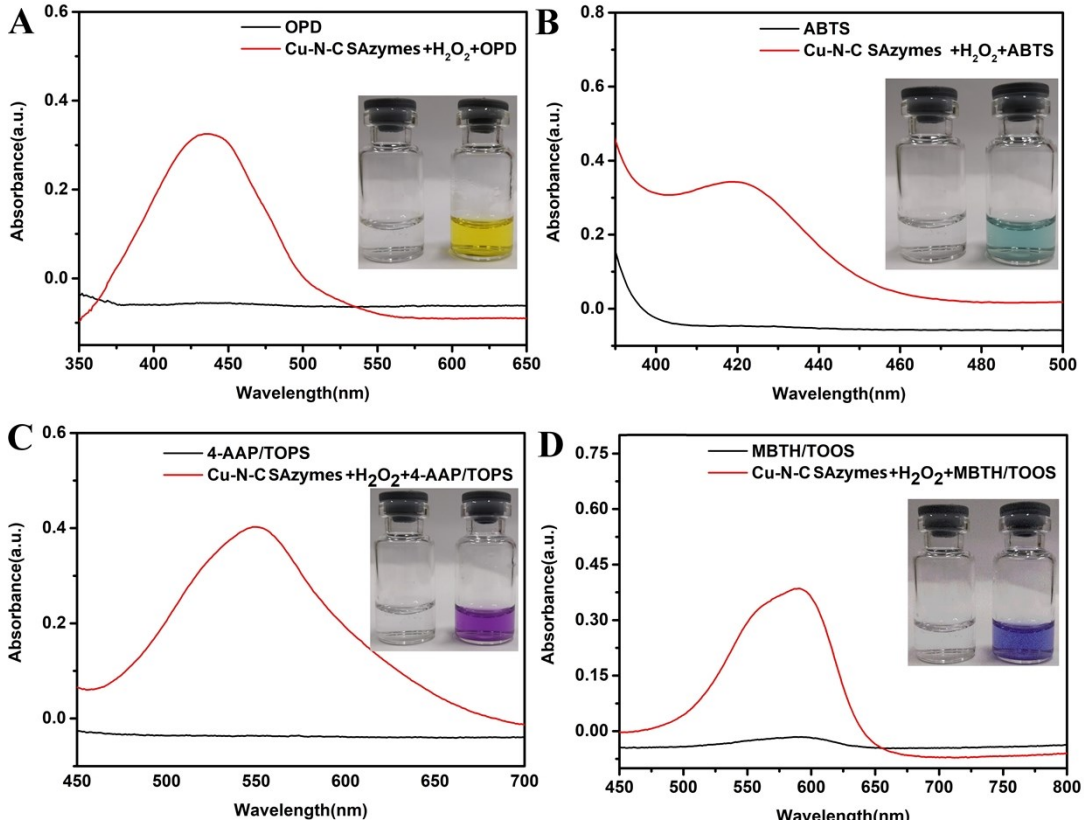

Figure S3 Photographs and absorption spectra of common chromogenic peroxidase substrates catalytically oxidized by Cu-N-C SAzymes in the presence of H_2O_2: (A) Cu-N-C SAzymes +H_2O_2+OPD, (B) Cu-N-C SAzymes+H_2O_2+ABTS, (C) Cu-N-C SAzymes +H_2O_2+4-AAP/TOPS, (D) Cu-N-C SAzymes+H_2O_2+MBTH/TOOS.

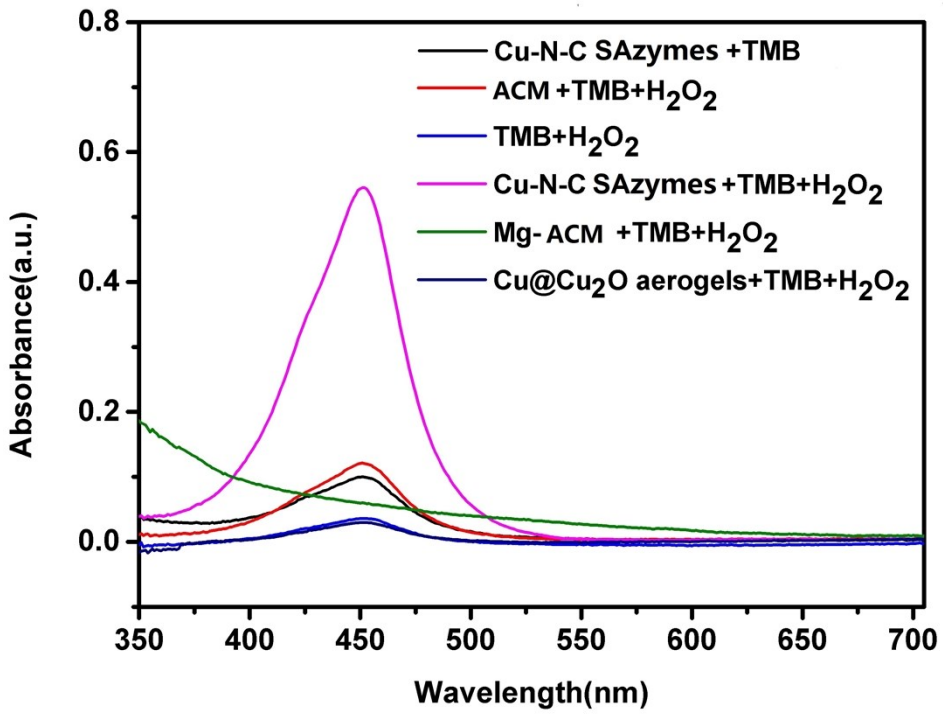

Figure S4 Typical absorption spectra of TMB in the presence of Cu-N-C SAzymes (black line), ACM and H_2O_2 (red line), H_2O_2 (blue line), Cu-N-C SAzymes and H_2O_2 (pink line), Mg-ACM and H_2O_2 (green line), Cu@Cu2O aerogels and H_2O_2 (navy line). The concentration of copper in Cu-N-C SAzymes and Cu@Cu2O aerogels are the same, which are determined by ICP MS.

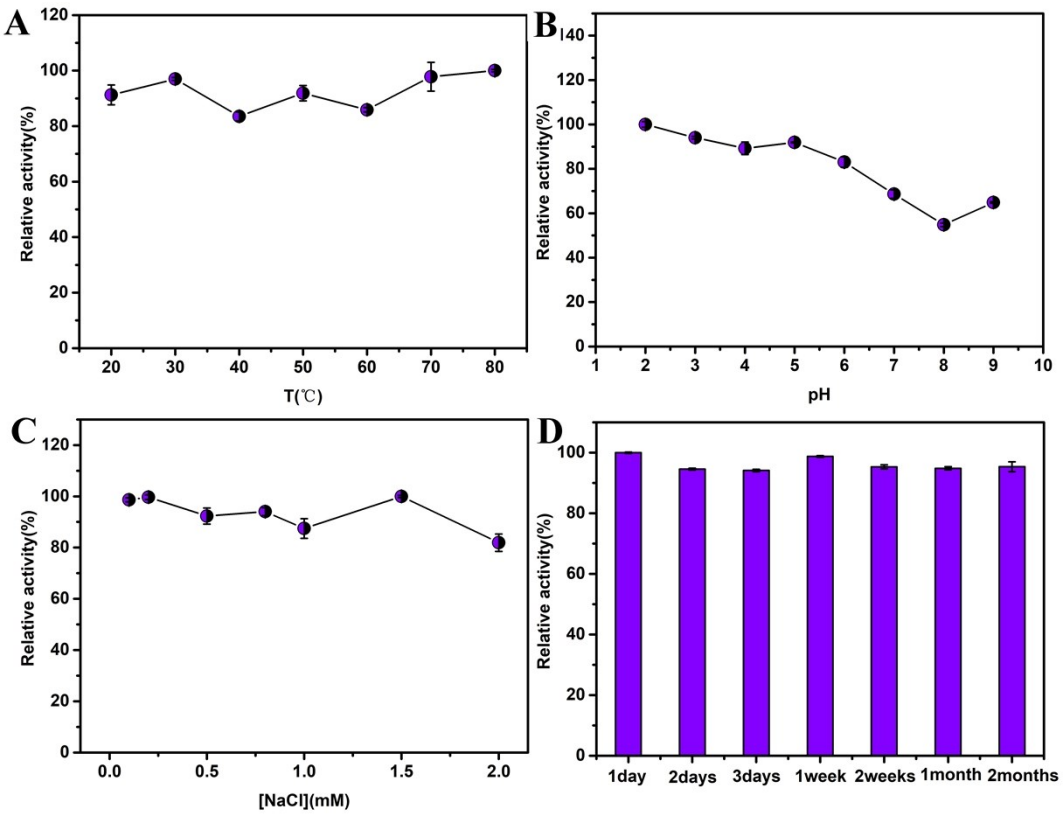

Figure S5 Relative activity of Cu-N-C SAzymes after incubation for 2 h at various (A) temperatures, (B) pH values, (C) NaCl concentrations and short- and long- term stabilities of Cu-N-C SAzymes at room temperature.

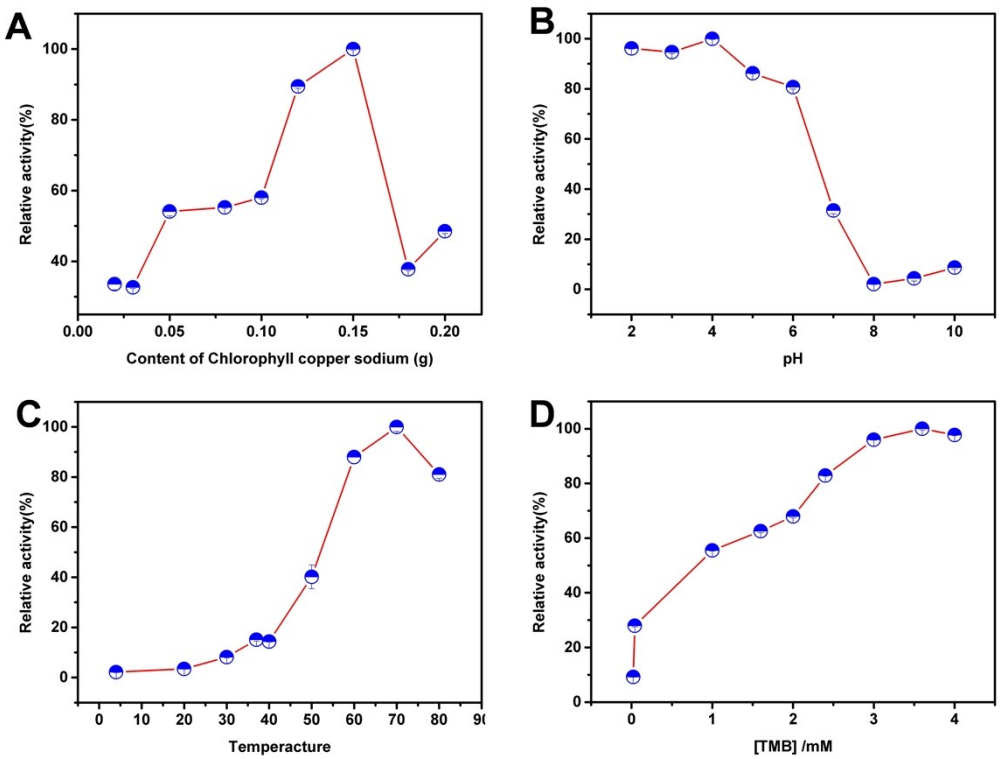

Figure S6 The effects of Cu-N-C SAzymes prepared from different (A) amount of sodium copper chlorophyll, (B) reaction pH, (C) reaction temperature, and (D) TMB concentration on the peroxidase-mimiking activity of Cu-N-C SAzymes in the presence of H_2O_2.

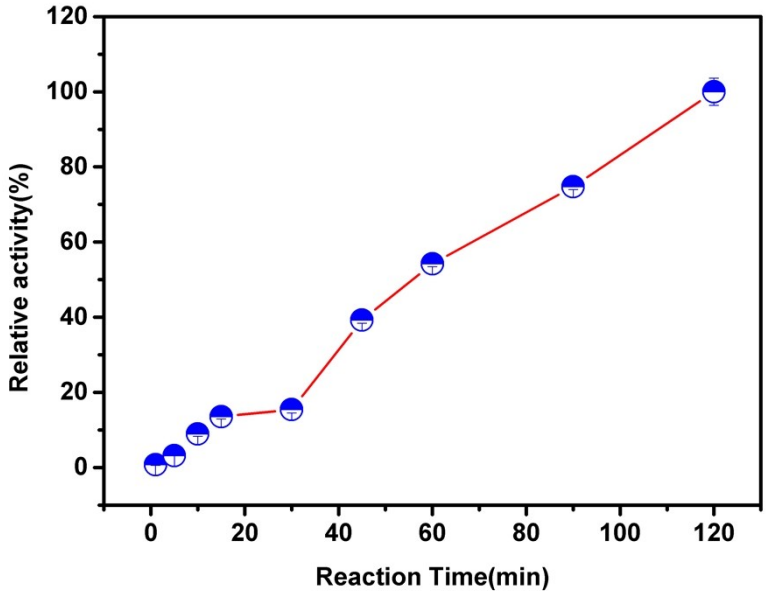

Figure S7 The effect of the time on the catalysis oxidation of TMB by Cu-N-C SAzymes.

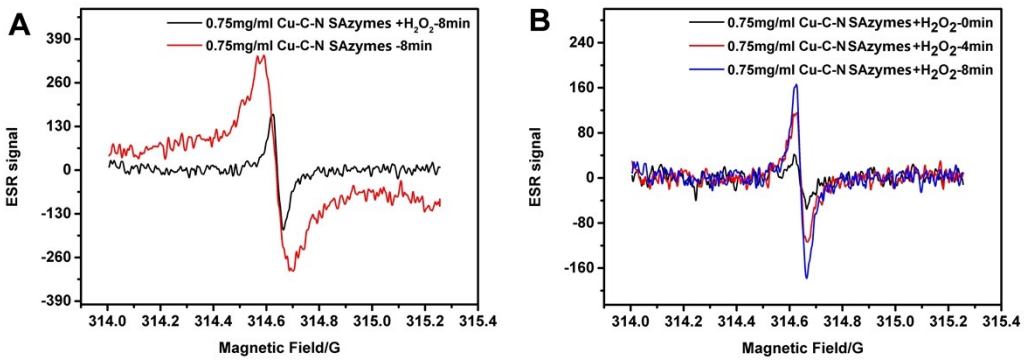

Figure S8 (A) ESR spectra of Cu-N-C SAzymes solution and Cu-N-C SAzymes-H_2O_2 solution. (B) Time-dependent ESR spectra of Cu-N-C SAzymes-H_2O_2 solution.

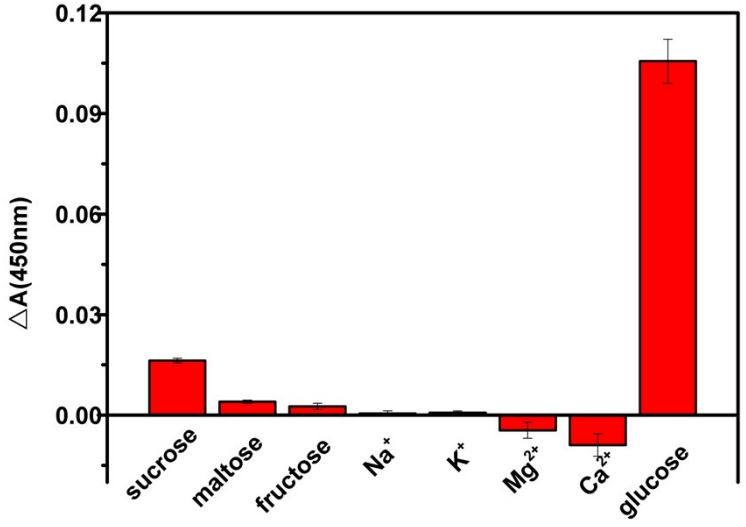

Figure S9 Selectivity of glucose detection by monitoring the absorbance at 450 nm with the colorimetric method using GOx and the as-prepared Cu-N-C SAzymes. The concentration of glucose was 20 μM. And all the interferents with a concentration of 100 μM were used.

Table S1. The K-edge EXAFS curves fitting parameters.

Sample	Path	Coordination Number	Bond length R (Å)	Bond disorder $\sigma^2\times10^{-3}$ (Å^2)	ΔE (eV)	R factor
Cu foil	Cu-Cu	12*	2.54±0.01	8.6±0.6	-6.5±0.9	0.002
Cu-N-C	Cu-N	4.2±0.5	1.90±0.01	4.8±1.5	-8.9±1.7	0.012
SAzymes	Cu-N/O-Cu	1.8±1.0	3.17±0.03	9.0±5.5	9.7±3.0	
CuCh	Cu-N	4.5±0.6	2.00±0.01	5.2±1.2	1.4±1.6	0.008
	Cu-C	5.1±1.4	3.00±0.02	3.2±2.4	0.8±2.3	

Table S2. Michaelis–Menten constant (K_m) and maximum velocity (V_{max}) obtained from the double reciprocal plots which have been compared with other nanozymes

Catalyst	Substrate	K_m(mM)	V_{max}(10^{-8} M s^{-1})	References
Cu-N-C SAzymes	TMB	0.1010	1.6025	This work
	H_2O_2	0.1715	1.2981	
M-CQDs	TMB	0.2189	0.8819	[1]
	H_2O_2	0.4305	0.4611	
N-CQDs	TMB	11.19	0.38	[2]
	H_2O_2	0.1	0.14	
C-Dots	TMB	0.039	3.61	[3]
	H_2O_2	26.77	30.61	
CuNPs@C	TMB	1.65	12.05	[4]
	H_2O_2	1.89	5.3	
Cu@Cu_2O	TMB	0.94	571	[5]
Cu-N-C	TMB	3.76	75.05	[6]
	H_2O_2	19.94	20.7	
CuO	TMB	0.013	/	[7]
	H_2O_2	85.6	/	
HRP	TMB	0.434	10.00	[8]
	H_2O_2	3.7	8.71	

Table S3. Comparison of various nanoparticles-based methods for detection of glucose.

System	Method	Linear range (μM)	Detection limit (μM)	References
Cu-N-C SAzymes	Colorimetry	0.1-20	0.05	this work
E-GQDs	Colorimetry	10-100	6.0	[9]
CuNPs@C	Colorimetry	50-350	0.32	[10]
r-CDs	Colorimetry	10-400	2	[11]
CuNPs-gC_3N_4	Colorimetry	1-100	0.37	[12]
Fe_3O_4@C	Colorimetry	6-100	2	[13]
CNT/FeNC SAN	Colorimetry	10000-100000	20	[14]
Rosette-GCN	Fluorescence	5-275	1.2	[15]
m-CeO_2	Colorimetry	20-1000	10	[16]

Table S4. Determination of glucose in human serum samples (n=3).

Serum sample	Spiked (mM)	Found (mM)	Recovery (%)	RSD (%)	Glucose assay kit(mM)
	0	2.09		4.57	2.03
1	2	4.05	98.0	1.73	
	5	7.23	102.8	0.57	
	0	2.15		0.80	2.12
2	2	4.07	96.0	4.99	
	5	7.29	102.8	0.66	
	0	1.73		1.54	1.68
3	2	3.76	101.5	3.22	
	5	6.96	104.6	3.67	
	0	2.01		1.73	1.97
4	2	3.98	98.5	1.14	
	5	7.11	102.0	3.04	
	0	2.43		4.50	2.4
5	2	4.44	100.5	1.45	
	5	7.36	98.6	1.73	
	0	2.53		3.60	2.55
6	2	4.50	98.5	0.41	
	5	7.66	102.6	0.75	

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