

Supporting Information

Strong Nanozymatic Activity of Thiocyanate Capped Gold Nanoparticles: An Enzyme-Nanozyme Cascade Reaction Based Dual Mode Ethanol Detection in Saliva

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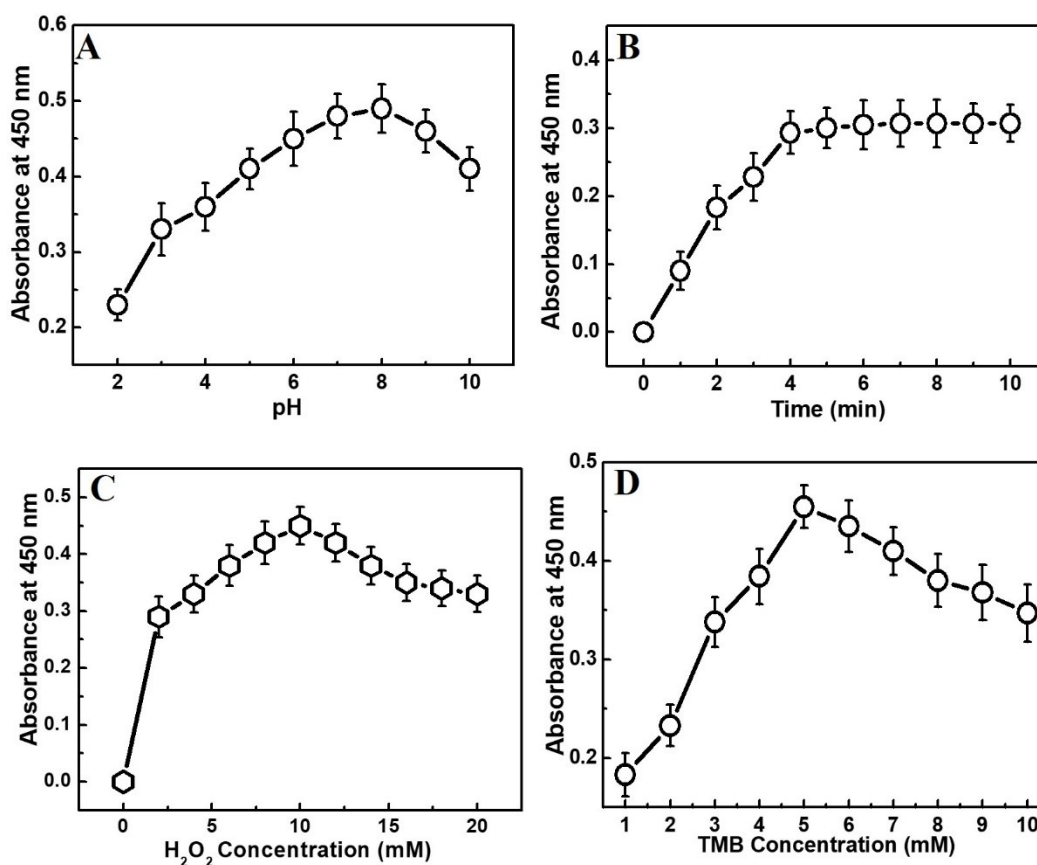


Figure S1: The nanozymatic activity of TC-Au NPs at different (A) pH values (Reaction conditions: 5 mM TMB and 10 mM H₂O₂); (B) Reaction times (Reaction conditions: 5-mM TMB, 10-mM H₂O₂ and pH 7.5 at 25°C); (C) Varied H₂O₂ concentrations with a fixed TMB concentration of 5 mM; and (D) Varied TMB concentrations with a fixed H₂O₂ concentration of 10 mM. The reaction conditions were fixed at pH 7.5 and 25°C. The error bars denote the standard deviation (n=3).

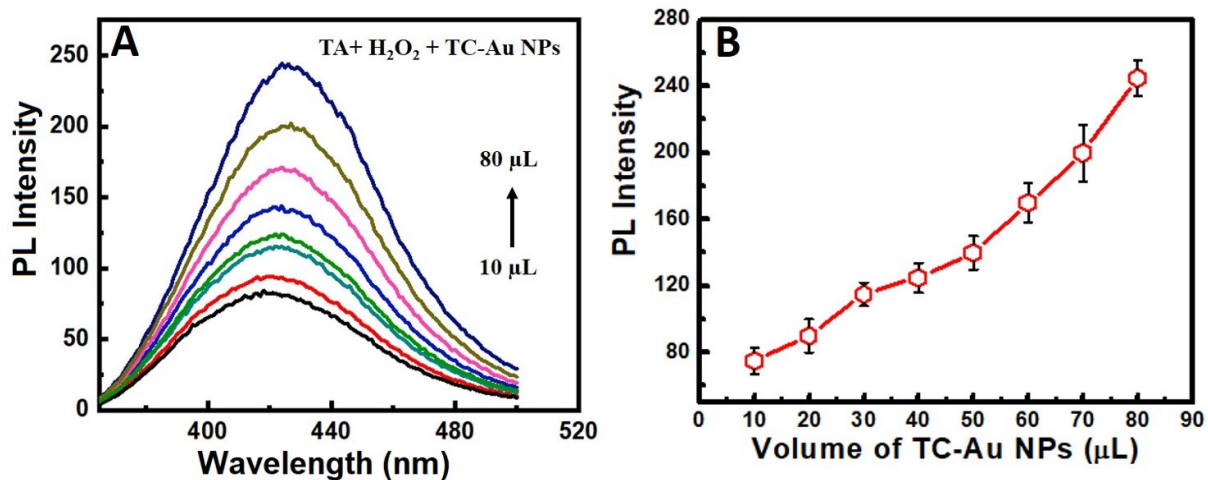


Figure S2: Nanozymatic activity study of TC-Au NPs: (A) TA based test of hydroxyl radical's formation by TC-Au NPs and (B) Calibration curve of PL intensity vs different volume of TC-Au NPs.

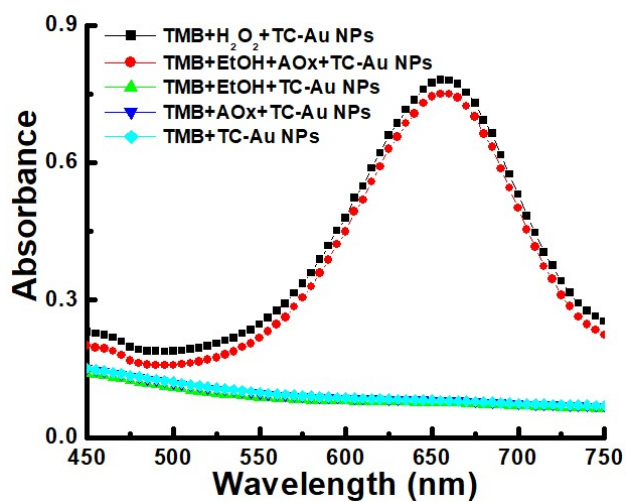


Figure S3: The specificity of EtOH detection in the presence different mixture solutions.

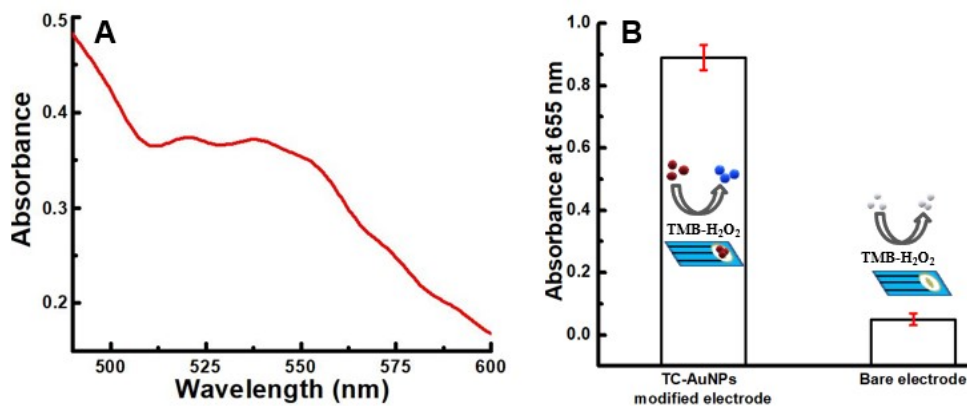


Figure S4: Confirmation of electrodes modification with TC-Au NPs: (A) absorbance of TC-Au NPs modified electrode; (B) nanozymatic nature of TC-Au NPs modified electrode in the presence of TMB-H₂O₂.

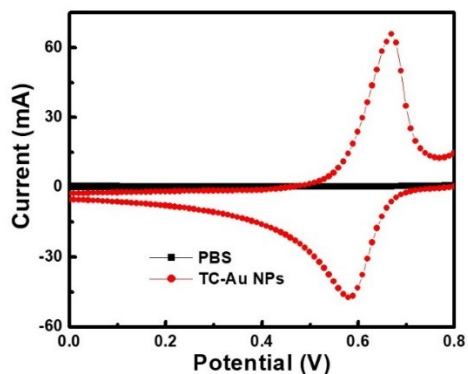


Figure S5: Electrochemical responses of TC-Au NPs.

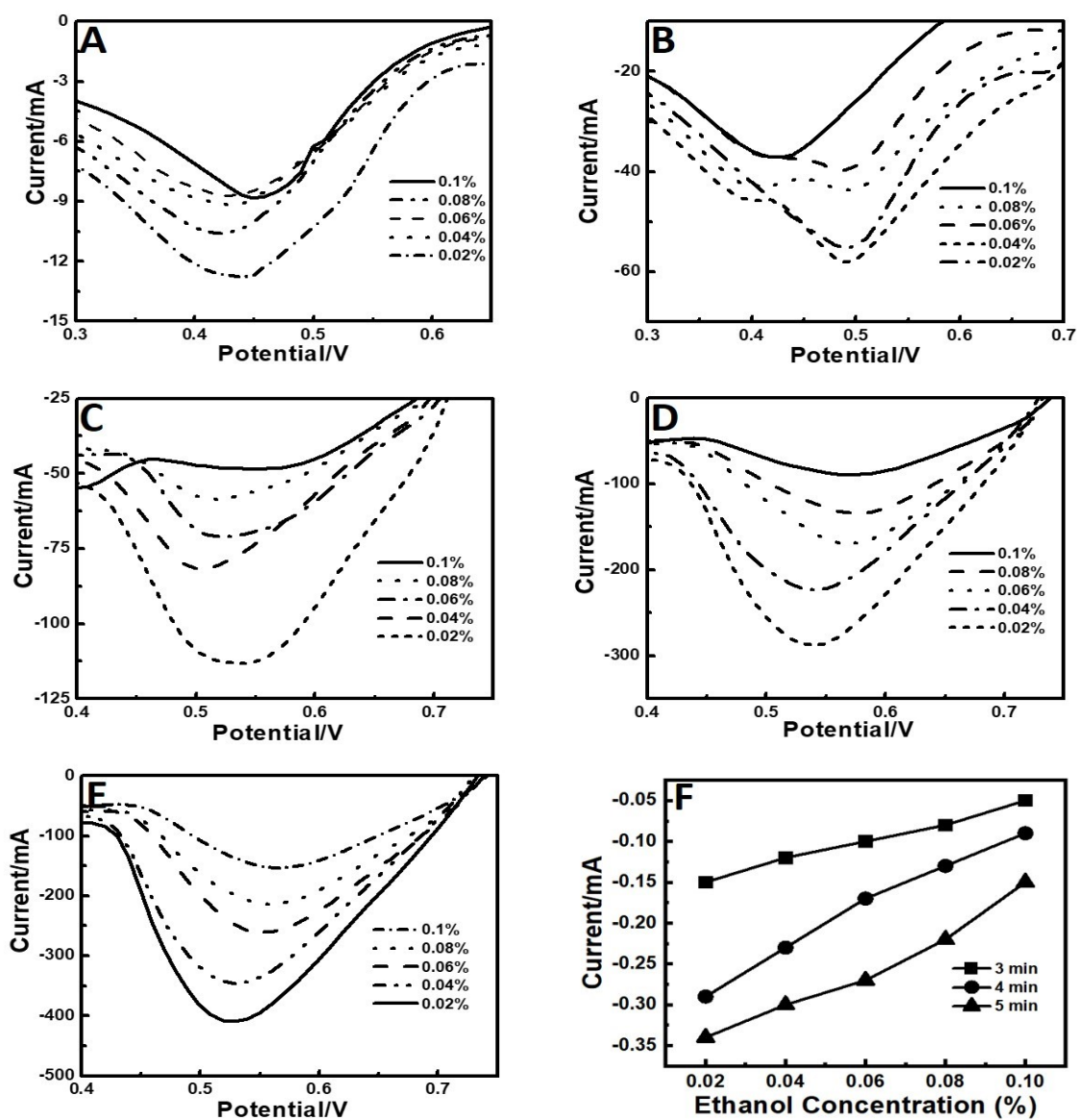


Figure S6: Electrochemical study of analytical performance: (A) CV of EtOH detection using reduction current of TMB within 1 min; (B) CV of EtOH detection using reduction current of TMB within 2 min; (C) CV of EtOH detection using reduction current of TMB within 3 min; (D) CV of EtOH detection using reduction current of TMB within 4 min; (E) CV of EtOH detection using reduction current of TMB within 5 min & (F) calibration curve of current vs EtOH at different concentration and time.

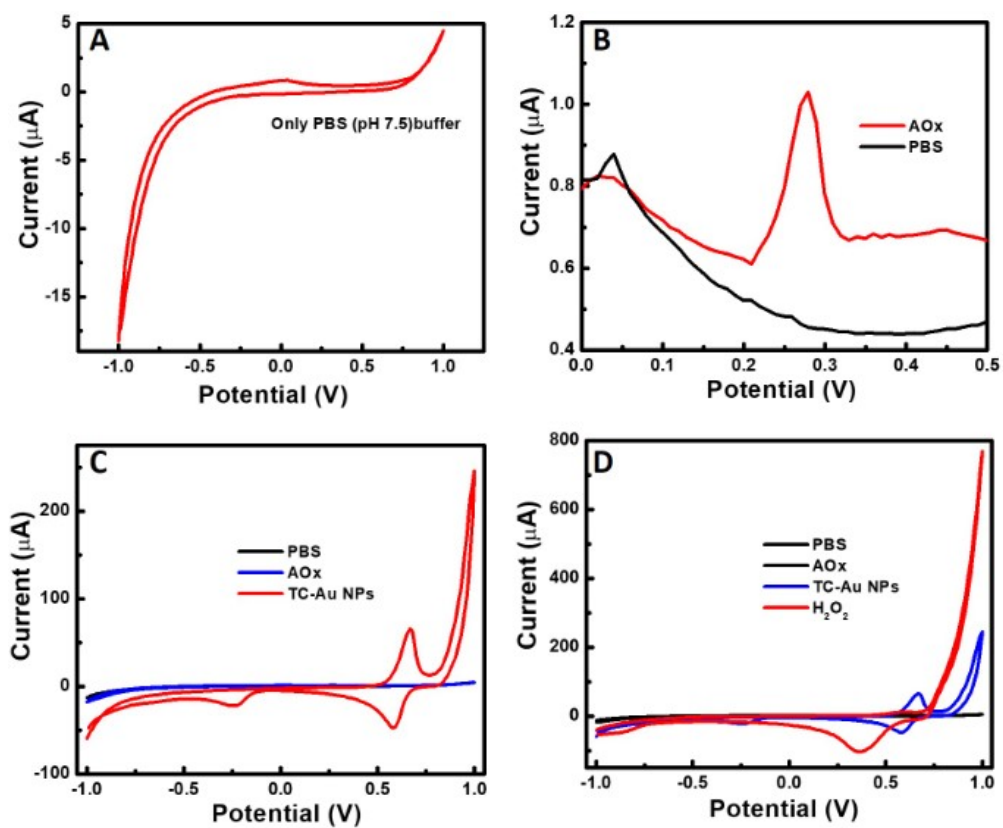


Figure S7: Electrochemical study of TC-Au NPs performance: (A) CV of bare PBS buffer; (B) CV of PBS buffer, AOx, and TC-Au NPs; and (D) CV of PBS buffer, AOx, TC-Au NPs, and H_2O_2 .

Table S1. The enzyme-like activity of single-metal nanoparticles

Metal NPs	Enzyme-mimic	Ref. No
Au	POD	1
Au	OXD	2
Au	CAT	3
Au	SOD	4
Ag	POD	5
Ag	OXD	6
Ag	CAT	7
Cu	POD	8
Pt	POD	9
Pt	OXD	10
Pt	CAT	11
Ru	POD	12
Ru	OXD	12
Ir	POD-like activity	13
Ir	OXD-like activity	14
Ir	CAT	15
Pd	POD	16
Pd	OXD	17
Pd	CAT	18

Table S2. The enzyme-like activity of hybrid nanomaterials

Hybrid nanomaterials	Enzyme-mimic activity	Ref. No
Au-Ag	POD	19
Au-Pt	POD	20
Au-Pd	POD	21
Pt-Pd	POD	22
Pt-Ru	Multiple	23
Pt-Co	OXD	24
Pd-Ir	POD	25
Pt-Cu	POD	26
Graphene-Pt	OXD	27
Ni-Pd	POD	28
Ce-MOF	OXD	29
MOF (Ce/Fe)	POD	30
Au-MOF	OXD	31

Table S3. Comparison study of Michaelis-Menten constant (K_m) of different capping agents of AuNPs.

Nanozymes	Substrate	K_m (mM)	K_{cat} (s^{-1})	Ref. No
Cysteamine-Au NPs	TMB	0.052	0.118×10^3	32
	H ₂ O ₂	213	0.310×10^3	
Citrate -Au NPs	TMB	0.049	0.527×10^3	32
	H ₂ O ₂	151	1.05×10^3	
Polyvinylpyrrolidone -Au NPs	TMB	0.055	1.22×10^3	32
	H ₂ O ₂	96	1.91×10^3	
Gum Arabic -Au NPs	TMB	0.094	1.82×10^3	32
	H ₂ O ₂	84	2.23×10^3	
TC-Au NPs	TMB	0.1	2.29×10^4	This study
	H ₂ O ₂	343.04	2.4×10^3	

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