

Electronic Supplementary information

Au@PtAg core/shell nanorods: tailoring enzyme activity via alloying

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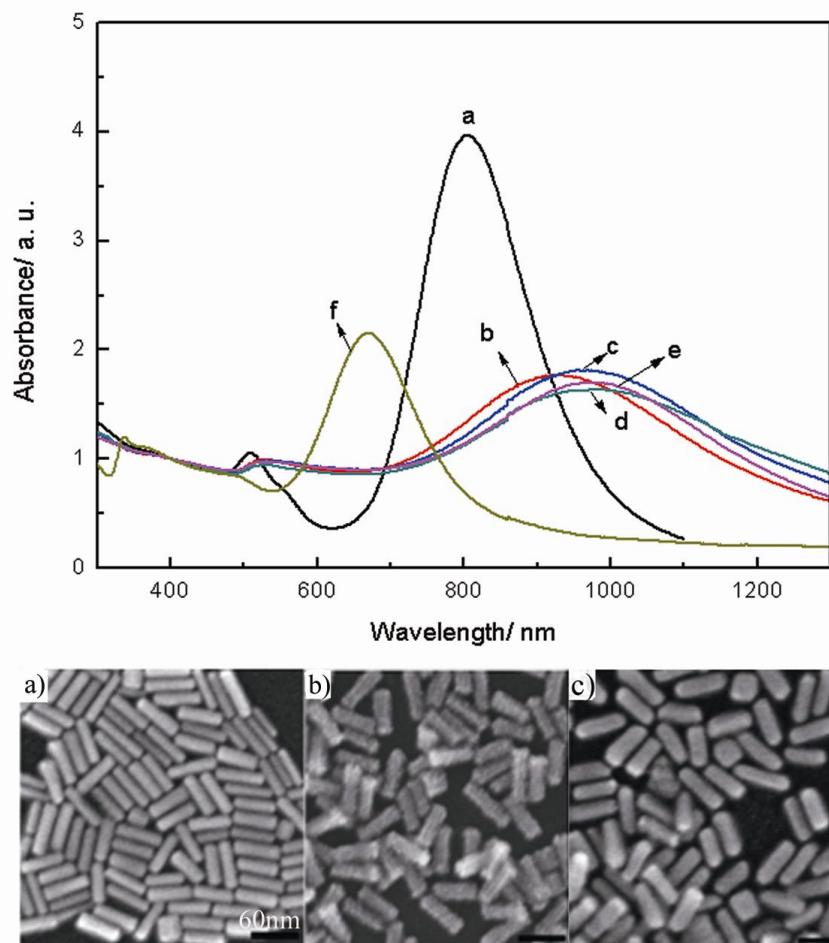


Fig. S1 UV-vis-NIR spectra of (a) Au NRs, (b) Au@Pt NRs, and (c-f) the Au@PtAg NRs with Ag/(Ag+Pt) ratio of 0.25, 0.5, 0.75, 1 and SEM images of (a) Au NRs, (b) Au@Pt NRs, and (c) Au@Ag NRs.

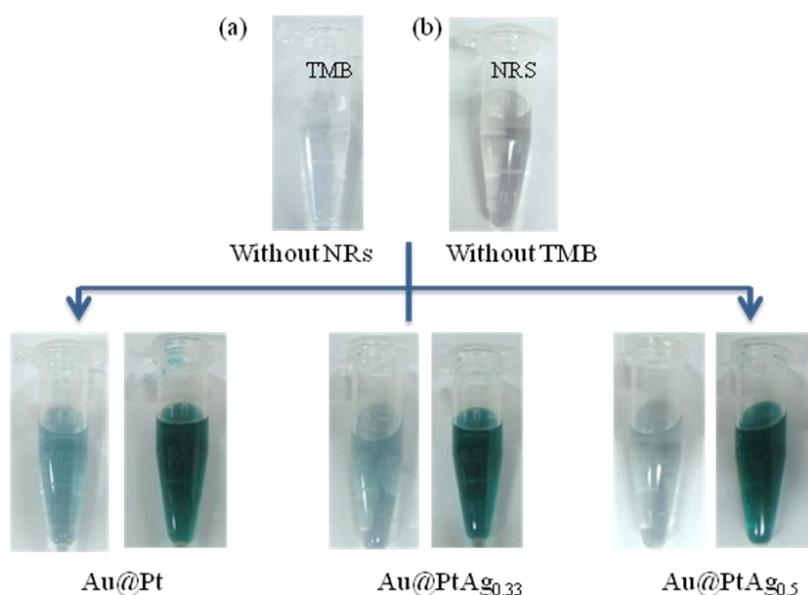


Fig. S2 Color evolution of TMB oxidation in the presence of either dissolved oxygen or H₂O₂ under the catalysis of Au@Pt, Au@PtAg_{0.33} or Au@PtAg_{0.5}. Conditions: [H₂O₂] = 0.1 M, [TMB] = 0.3 mM, [NRs] = 0.1 nM at 30°C. The photos were taken at 10 min after the addition of catalyst.

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Table S1. Composition change measured by EDX before and after leaching of Au@PtAg₃ NRs.

	Ag/Pt	Pt/Au
Before leaching	2.2	0.34
After leaching	1.6	0.33

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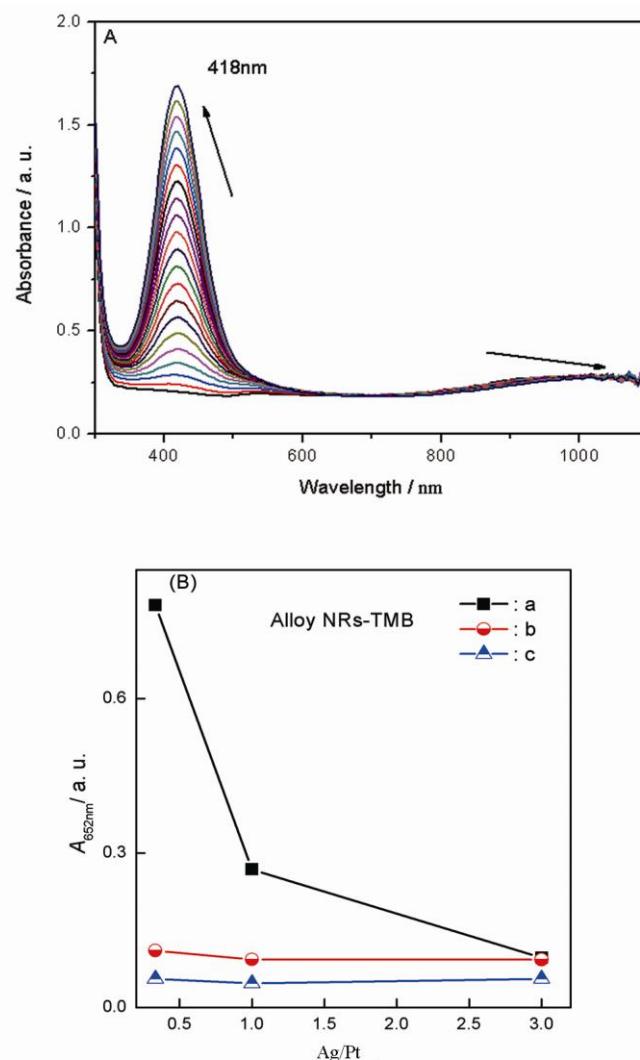


Fig. S3 (A) Evolution of UV-vis-NIR absorption spectra for OPD oxidation in the presence of $\text{Au}@\text{PtAg}_3$ NRs with 1 min interval. (B) Effect of leaching on TMB oxidation. Plot of absorbance at 652 nm after reaction for 20 min versus Ag/Pt ratio: (a) original NRs, (b) supernatants after leaching, and (c) supernatants without leaching.

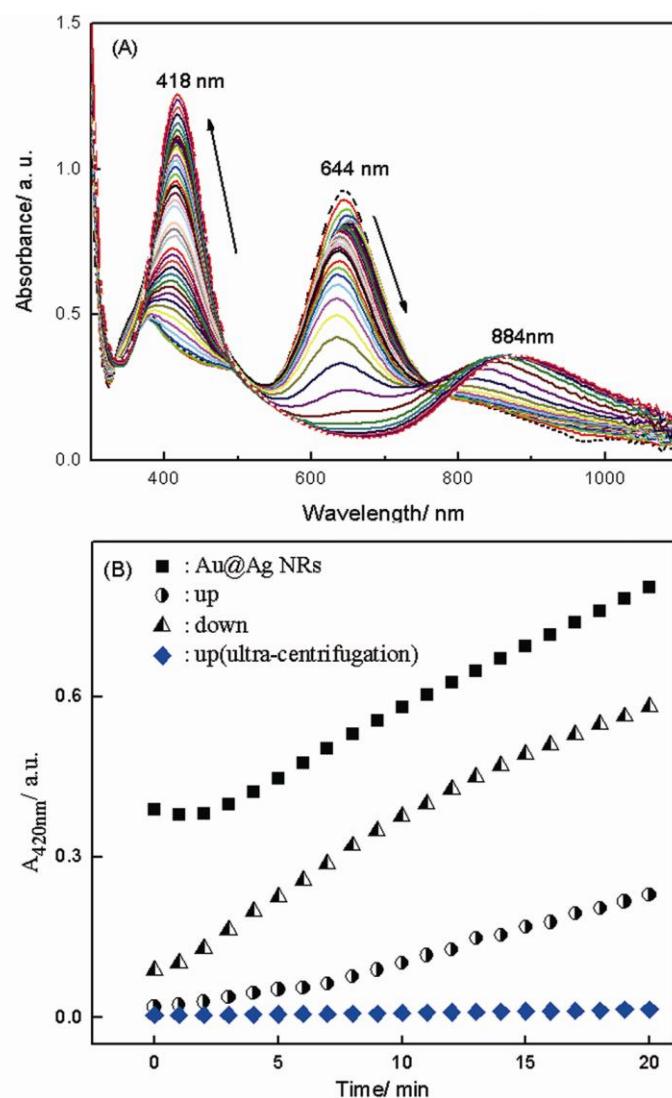


Fig. S4 (A) Evolution of UV-vis-NIR absorption spectra for OPD oxidization in the presence of Au@Ag NRs with 1 min interval. (B) Au@Ag NRs activity does not result from Ag^+ ions. Color reaction conditions: $[\text{H}_2\text{O}_2] = 0.1 \text{ M}$, $[\text{OPD}] = 0.4 \text{ mM}$, $\text{pH} = 4.5$ at 40°C .

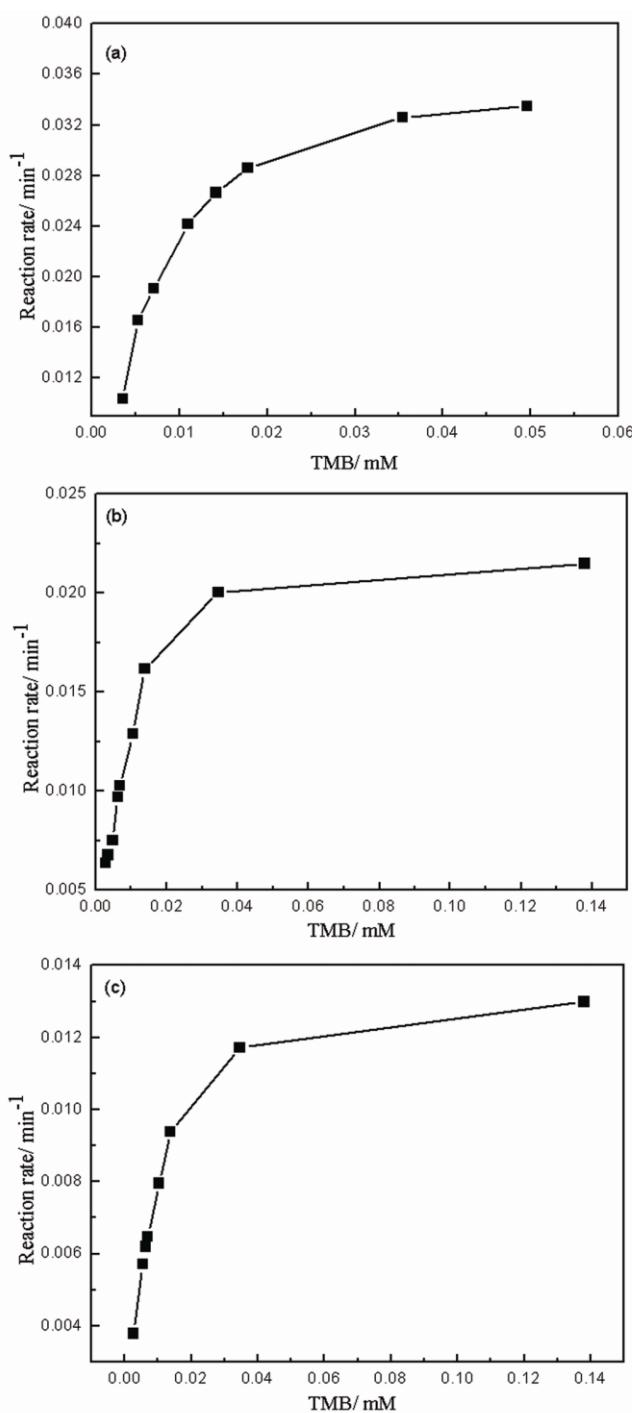


Fig. S5 Oxidase-like enzyme activities: effect of TMB concentration on initial reaction rate: Au@Pt (a), Au@PtAg_{0.33} (b) or Au@PtAg_{0.5} (c) NPs.

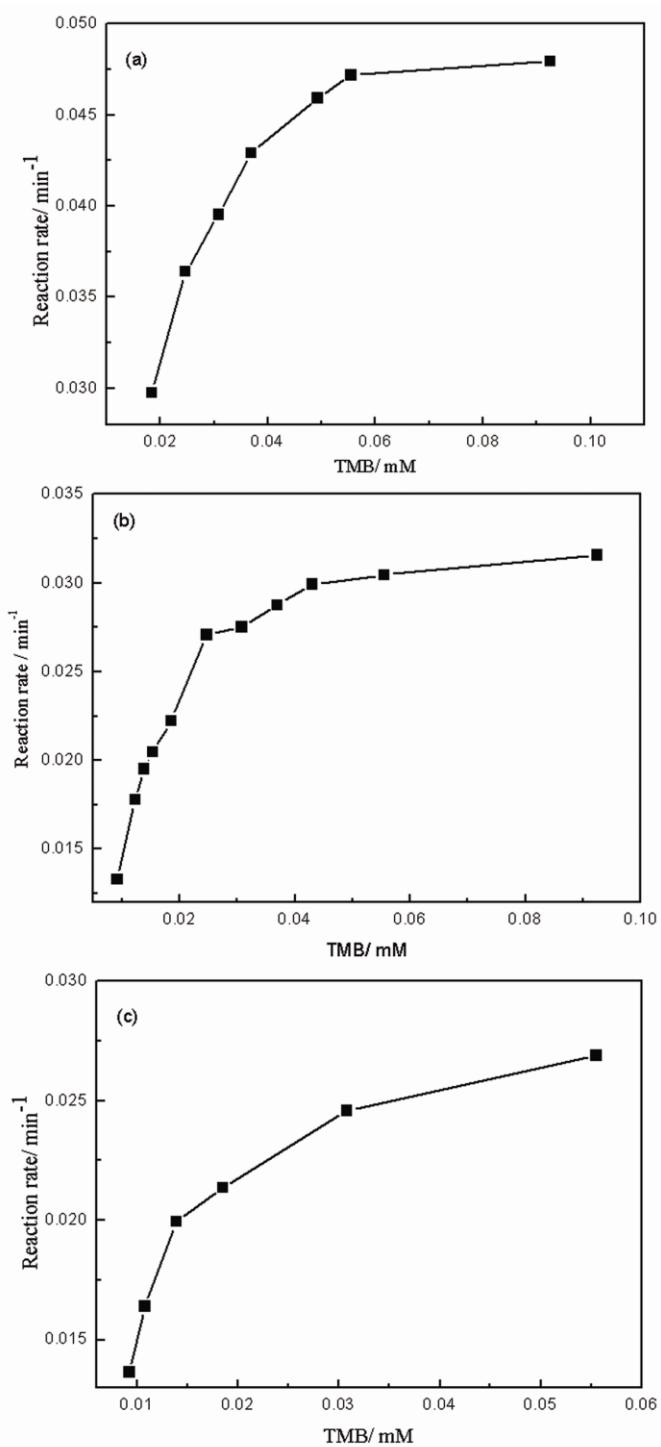


Fig. S6 Peroxidase-like activities: effect of TMB concentration on initial reaction rate in the presence of hydrogen peroxide ($[H_2O_2] = 2$ mM): (a) Au@Pt, (b) Au@PtAg_{0.33} or (c) Au@PtAg_{0.5} NRs.

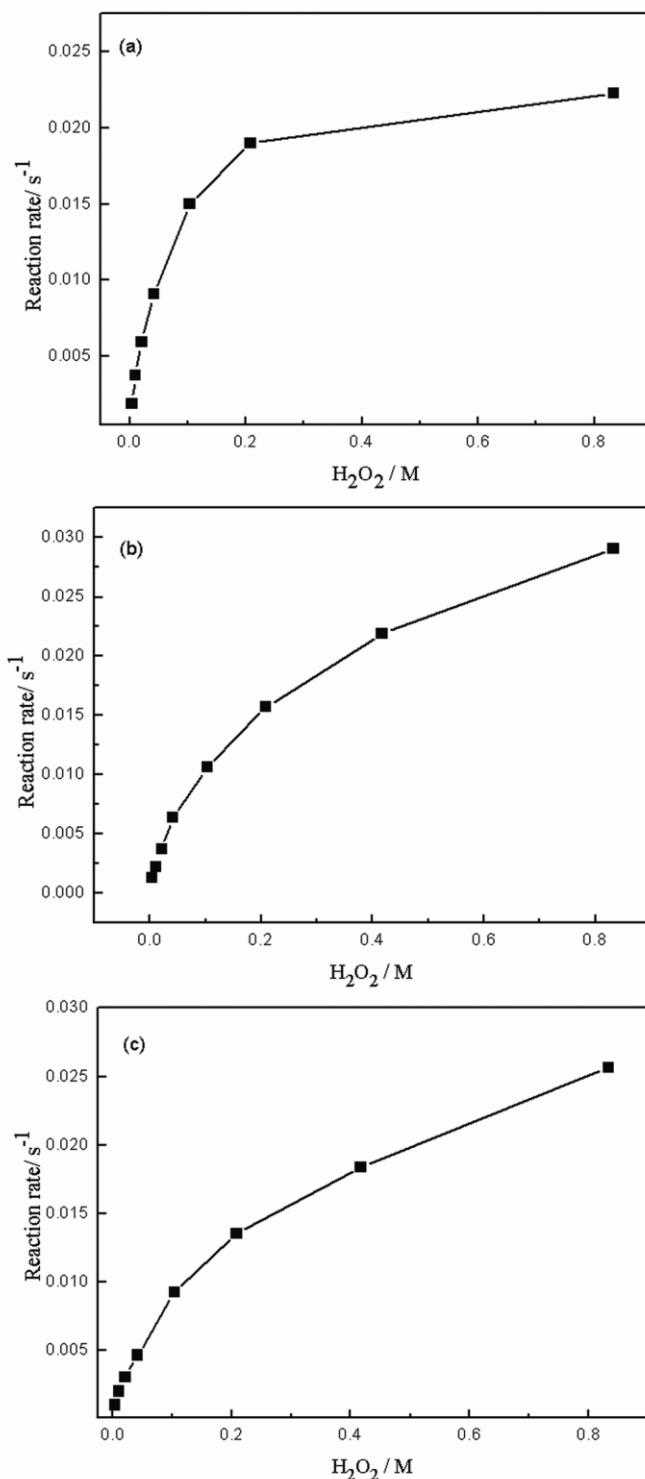


Fig. S7 Peroxidase-like activities: effect of H_2O_2 concentration on the reaction rate: (a) Au@Pt, (b) Au@PtAg_{0.33} or (c) Au@PtAg_{0.5} NRs, $[\text{TMB}] = 0.13 \text{ mM}$.

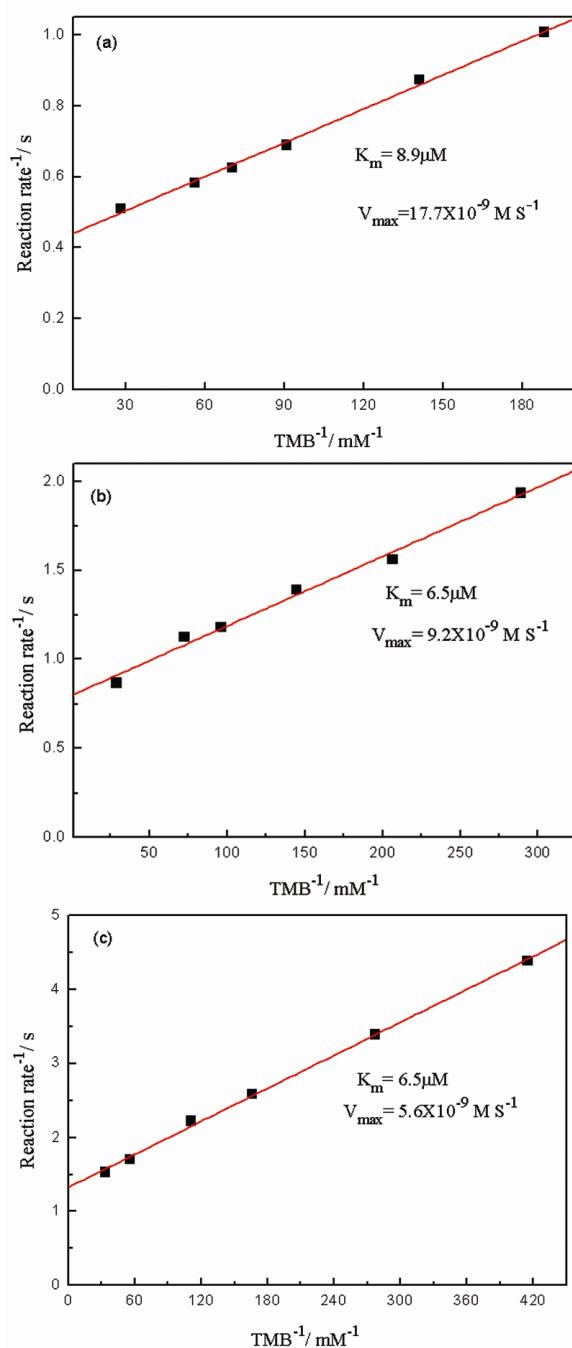


Fig. S8 Oxidase mimetics: double reciprocal plots of reaction rate versus TMB concentration at a fixed NR concentration for Au@Pt (a), Au@PtAg_{0.33} (b) or Au@PtAg_{0.5} (c) NRs.

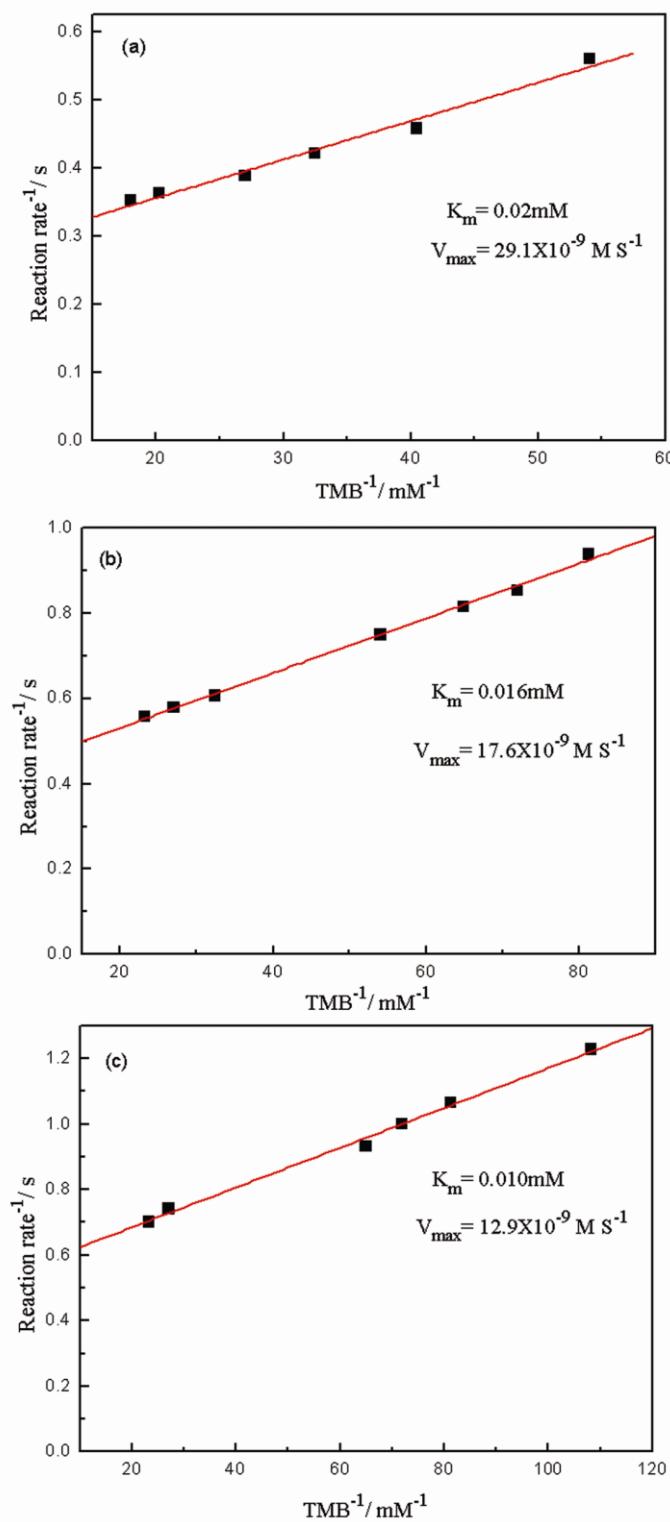


Fig. S9 Peroxidase mimetics: double reciprocal plots of reaction rate versus TMB concentration at a fixed NR concentration for Au@Pt (a), Au@PtAg_{0.33} (b) or Au@PtAg_{0.5} (c) NRs.

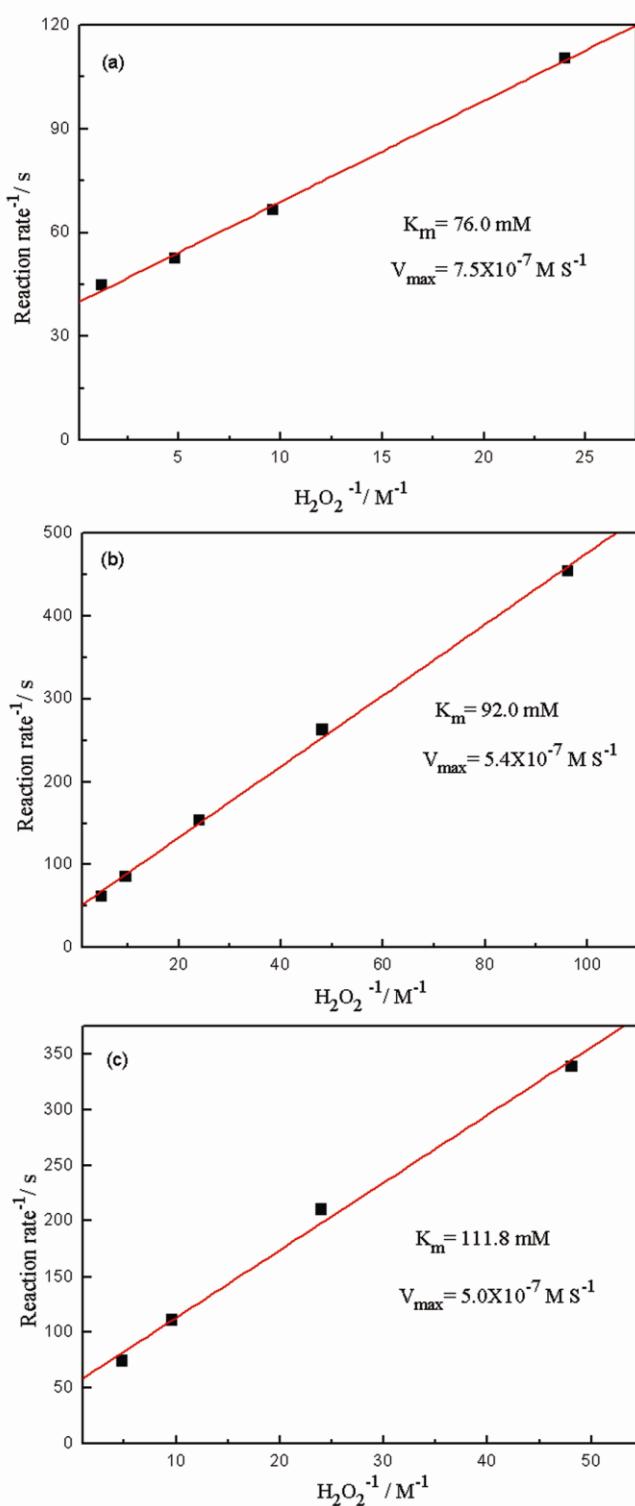


Fig. S10 Peroxidase mimetics: double reciprocal plots of reaction rate versus H_2O_2 concentration at a fixed NR concentration for $\text{Au}@\text{Pt}$
5 (a), $\text{Au}@\text{PtAg}_{0.33}$ (b) or $\text{Au}@\text{PtAg}_{0.5}$ (c) NRs.

Table S2. Electrochemical parameters calculated from H adsorption/desorption cyclic voltammograms taken in sulfuric acid solution.

	Ratio	Q_H [mC cm ⁻²]	N_H	EAS [m ² g ⁻¹]
Au@AgPt Pt/Au=0.27	0	0.91	5.69E18	13.6
	Pt/Ag=4/1	1.17	7.31E18	17.5
	Pt/Ag=3/1	1.3	8.13E18	19.4
	Pt/Ag=2/1	1.3	8.13E18	19.4

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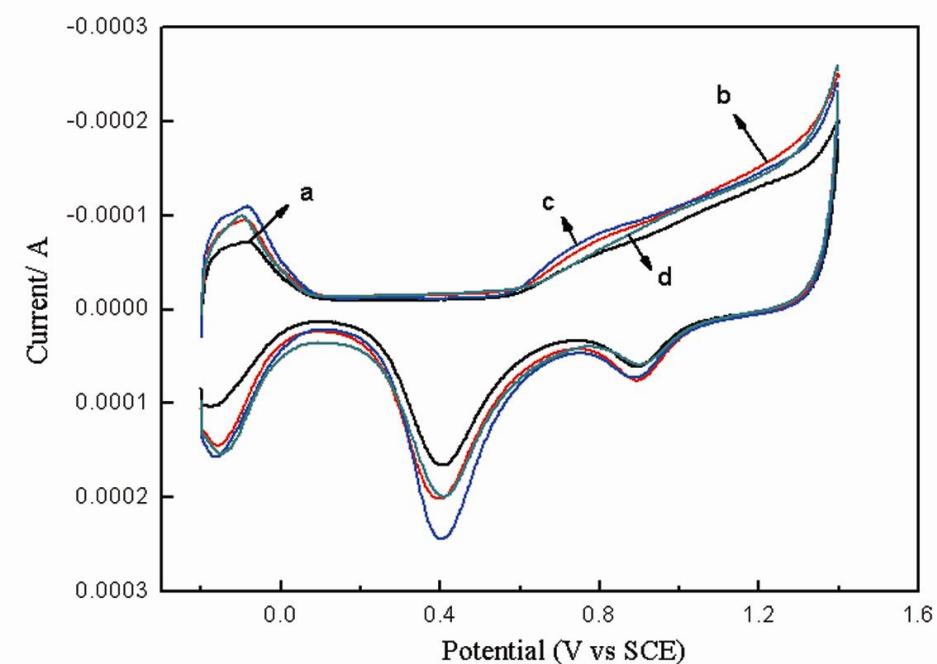


Fig. S11 CVs of Au@Pt NR-modified (a) and Au@PtAg NR-modified glass carbon electrodes (b-d) in 0.5 M H₂SO₄ solution taken at a scan rate of 50 mV s⁻¹. The Pt/Ag ratio is 4/1(b), 3/1(c), 2/1(d).

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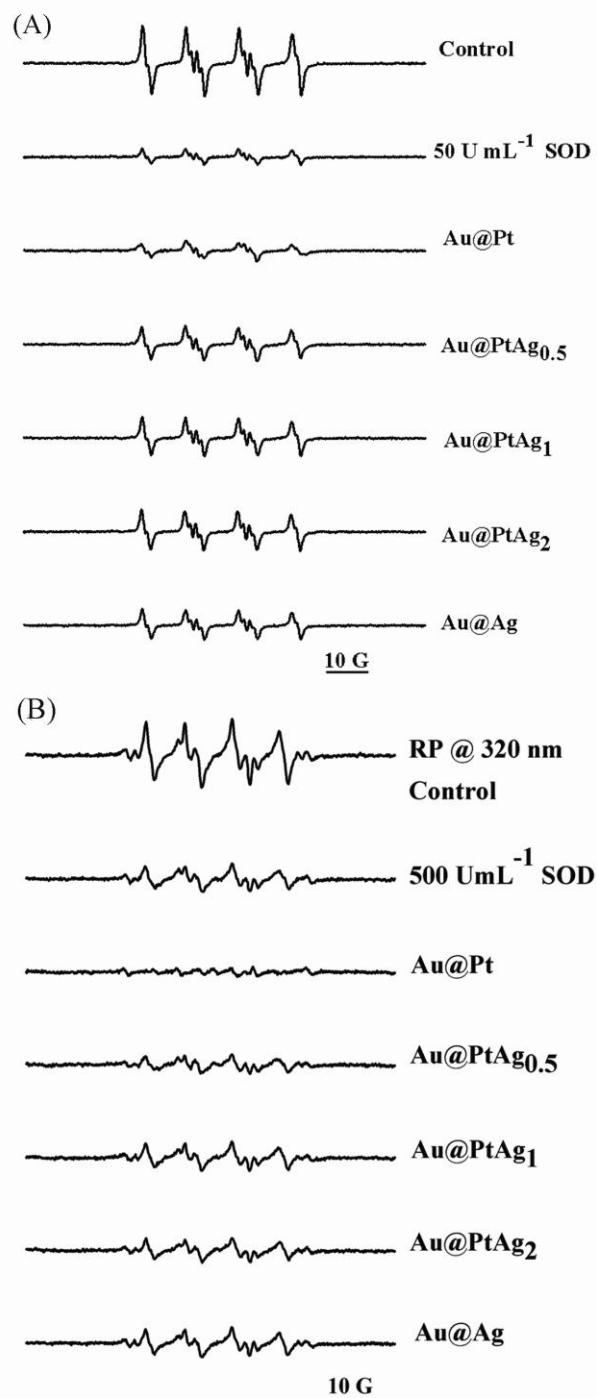


Fig. S12 ESR spectra of BMPO-•OOH for testing superoxide radical scavenging activity of the alloy NRs. (A) samples contained 25 mM BMPO, 2.5 mM KO₂, 0.35 mM 18-Crown-6, 20% (v/v) DMSO, and 5 nM alloy NRs or 50 U mL⁻¹ SOD in 50 mM PBS buffer (pH 7.4). The ESR spectra were recorded after 3 min of addition of KO₂. (B) samples contained 4 nM various alloy NRs or 500 U mL⁻¹ SOD, 20 mM BMPO, and 0.15 mg mL⁻¹ RP in 70% (v/v) ethanol. Samples were irradiated at a wavelength of 320 nm for 10 min. The ESR spectra were scanned for 9 scans.

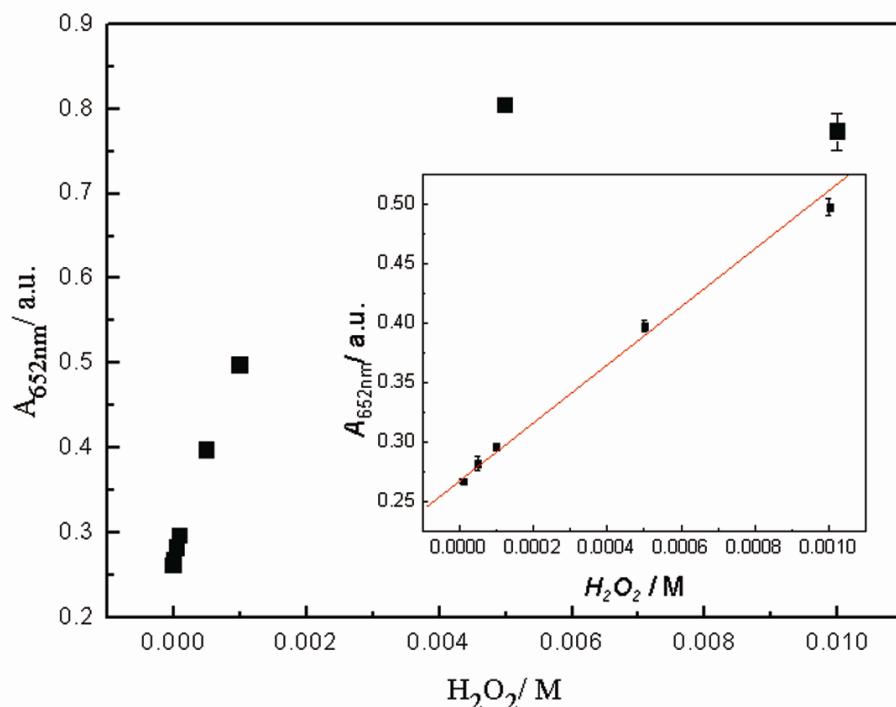


Fig. S13 Dose-response curve for H_2O_2 detection using Au@Pt NRs as peroxidase Mimetics. Inset: the linear calibration plot for H_2O_2 . The error bars represent the standard deviation of three measurements. Reaction conditions: $T=37\text{ }^\circ\text{C}$, pH 4.5, $[\text{TMB}] = 0.1\text{ mM}$. Pt^{2+}/Au was fixed at 0.27.

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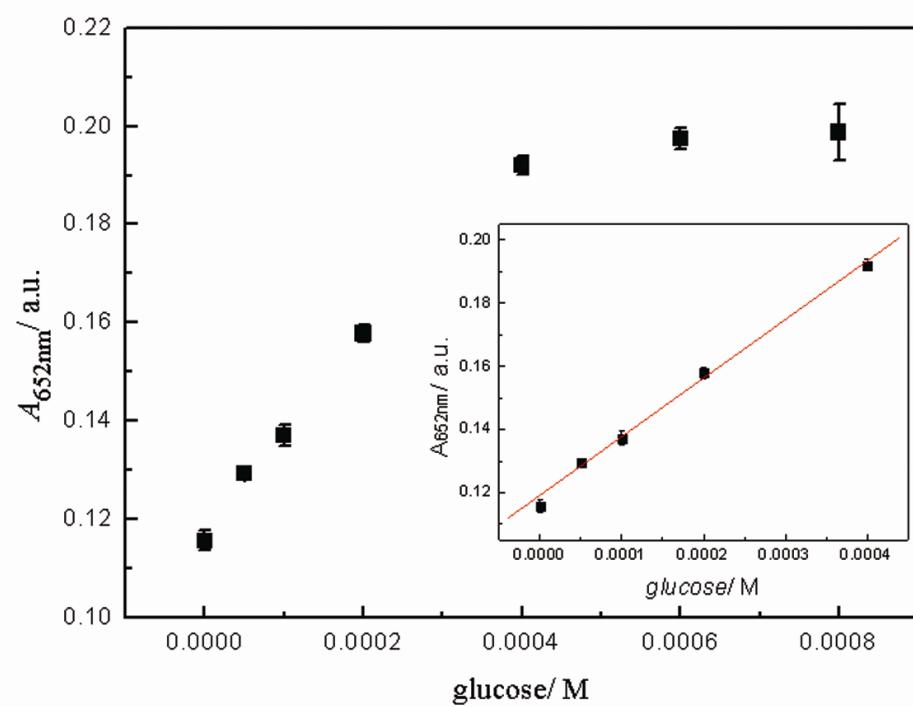


Fig. S14 Dose-response curve for glucose detection using the combination of Au@Pt NRs and GOx. Inset: the linear calibration plot for glucose detection. The error bars represent the standard deviation of three measurements. Reaction conditions: $T=37\text{ }^\circ\text{C}$, pH 4.5, $[\text{TMB}] = 0.1\text{ mM}$. Pt^{2+}/Au was fixed at 0.27.