

Supplementary Information

Glucose-oxidase like catalytic mechanism of noble metal nanozymes

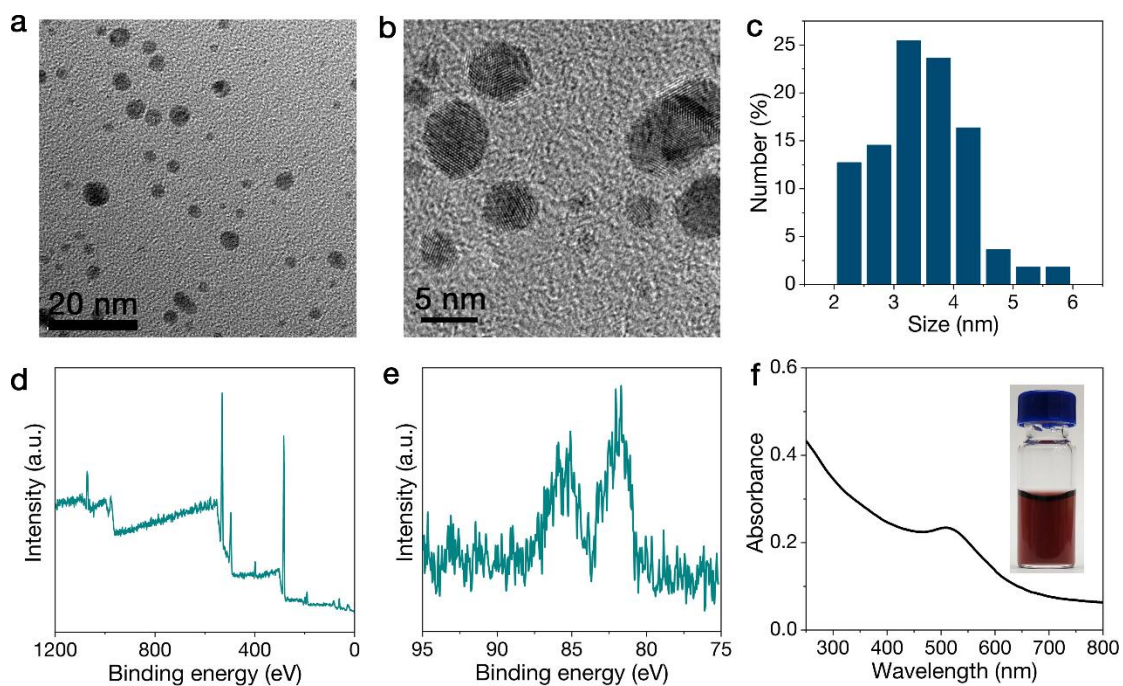
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44 **Supplementary Fig. 1. Characterizations of Au nanoparticles. (a, b)**

45 TEM images of Au nanoparticles. (c) Size distribution of Au nanoparticles.

46 (d, e) XPS spectra of Au nanoparticles. (f) UV-Vis spectrum of Au

47 nanoparticles. The inset shows Au nanoparticles dispersed in water.

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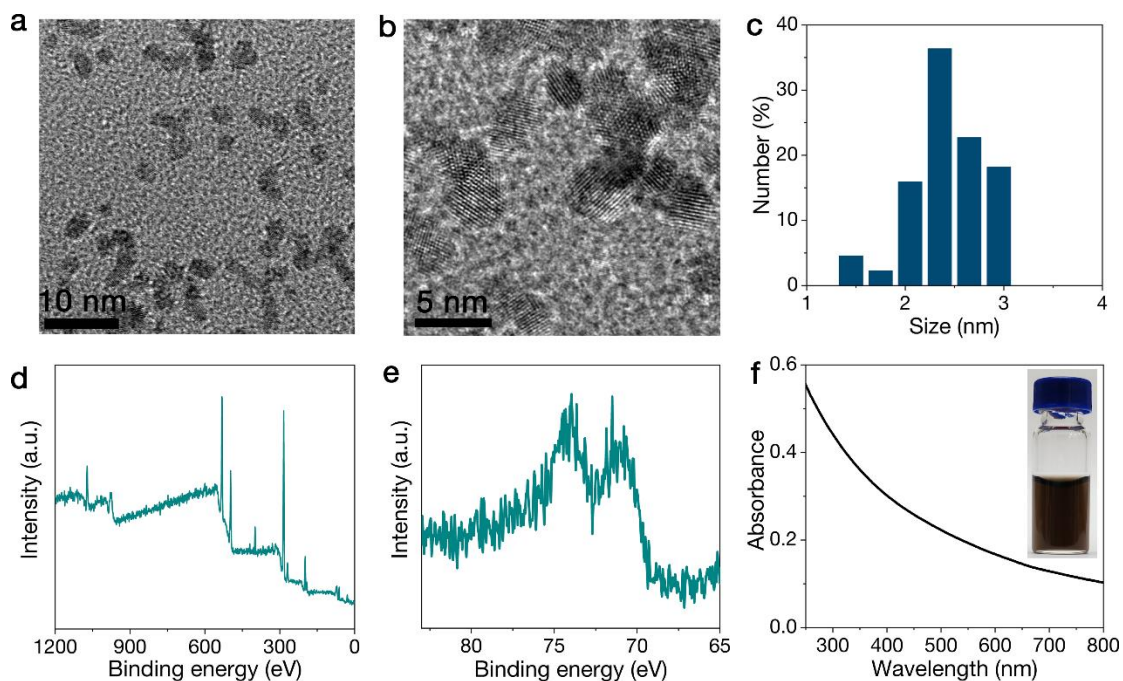
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59 **Supplementary Fig. 2. Characterizations of Pt nanoparticles.** (a, b)

60 TEM images of Pt nanoparticles. (c) Size distribution of Pt nanoparticles.

61 (d, e) XPS spectra of Pt nanoparticles. (f) UV-Vis spectrum of Pt

62 nanoparticles. The inset shows Pt nanoparticles dispersed in water.

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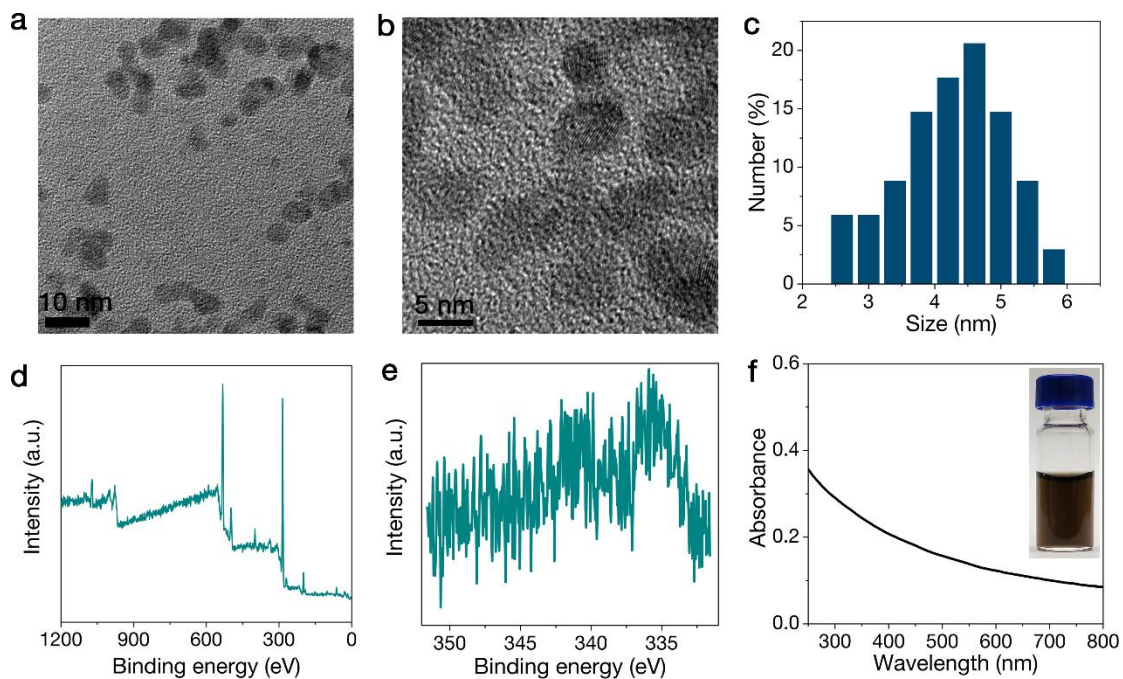
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74 **Supplementary Fig. 3. Characterizations of Pd nanoparticles. (a, b)**

75 TEM images of Pd nanoparticles. (c) Size distribution of Pd nanoparticles.

76 (d, e) XPS spectra of Pd nanoparticles. (f) UV-Vis spectrum of Pd

77 nanoparticles. The inset shows Pd nanoparticles dispersed in water.

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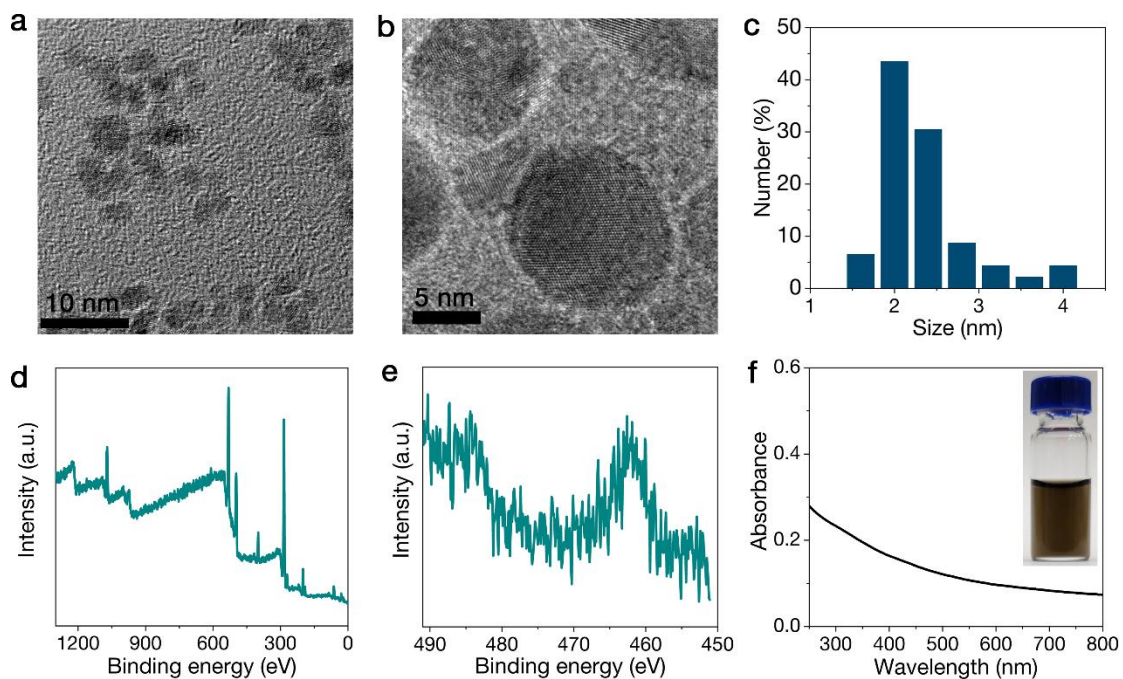
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89 **Supplementary Fig. 4. Characterizations of Ru nanoparticles. (a, b)**

90 TEM images of Ru nanoparticles. (c) Size distribution of Ru nanoparticles.

91 (d, e) XPS spectra of Ru nanoparticles. (f) UV-Vis spectrum of Ru

92 nanoparticles. The inset shows Ru nanoparticles dispersed in water.

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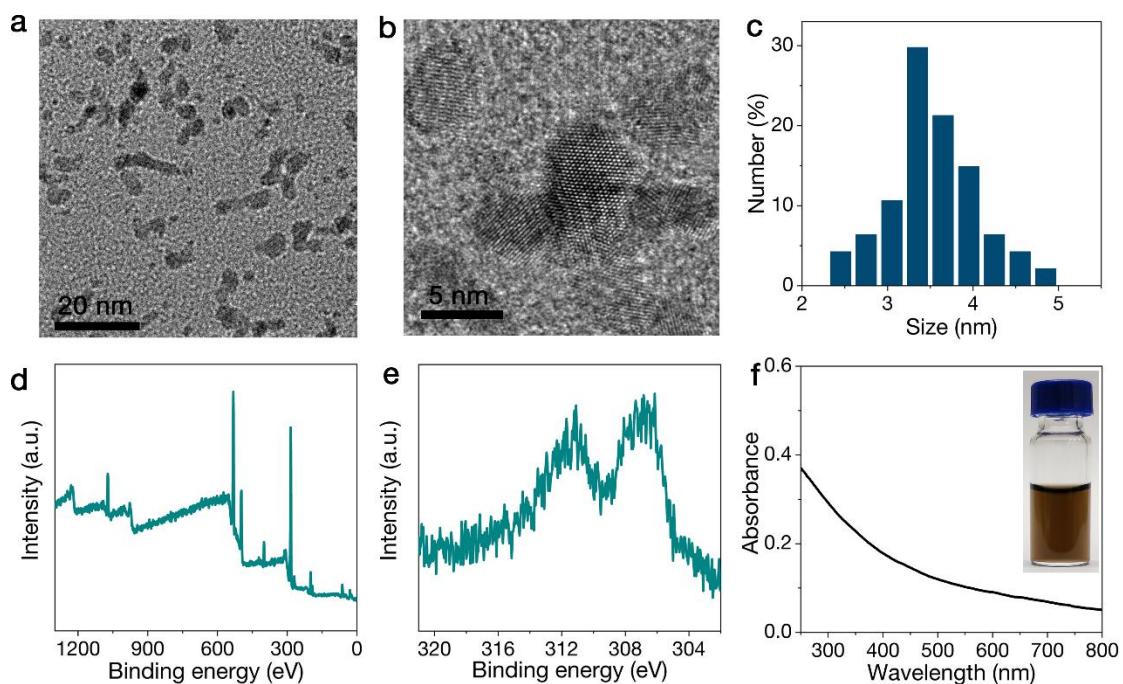
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105 **Supplementary Fig. 5. Characterizations of Rh nanoparticles.** (a, b)

106 TEM images of Rh nanoparticles. (c) Size distribution of Rh nanoparticles.

107 (d, e) XPS spectra of Rh nanoparticles. (f) UV-Vis spectrum of Rh

108 nanoparticles. The inset shows Rh nanoparticles dispersed in water.

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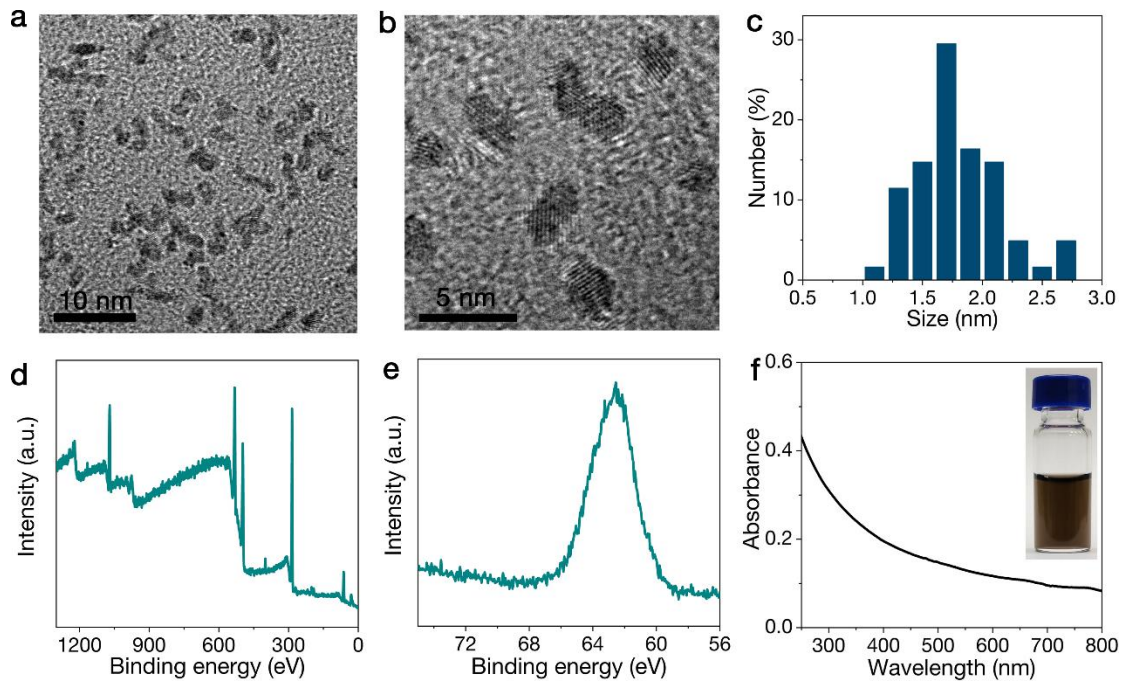
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119 **Supplementary Fig. 6. Characterizations of Ir nanoparticles. (a, b)**

120 TEM images of Ir nanoparticles. (c) Size distribution of Ir nanoparticles.

121 (d, e) XPS spectra of Ir nanoparticles. (f) UV-Vis spectrum of Ir

122 nanoparticles. The inset shows Ir nanoparticles dispersed in water.

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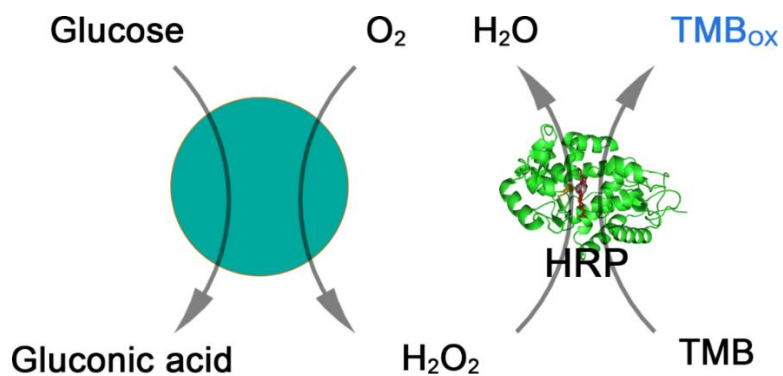
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134 **Supplementary Fig. 7.** Schematic representation of the detection of H_2O_2
135 produced during oxidation of glucose catalyzed by Au NPs.

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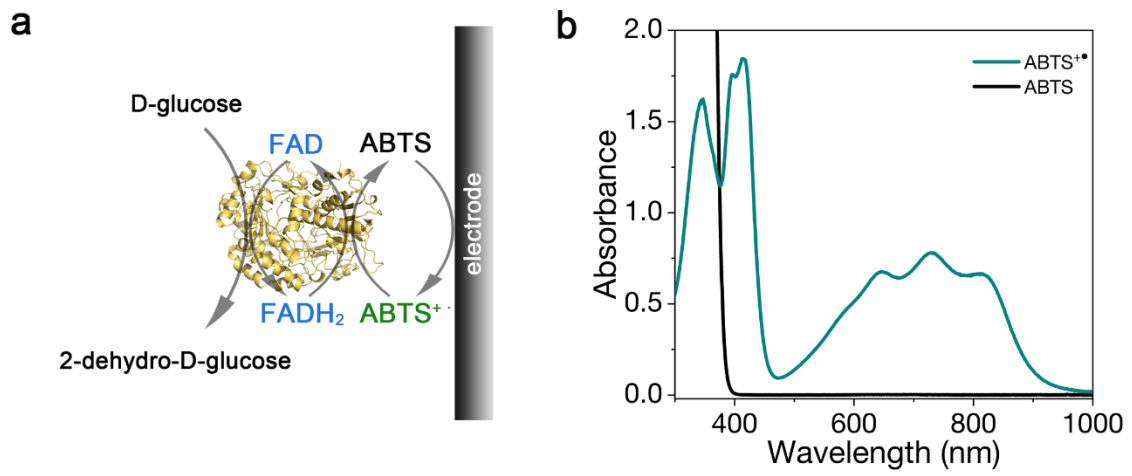
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153 **Supplementary Fig. 8.** (a) Schematic diagram of ABTS as a mediator of
154 glucose oxidase. (b) UV-vis spectra of ABTS and ABTS^{•+}.

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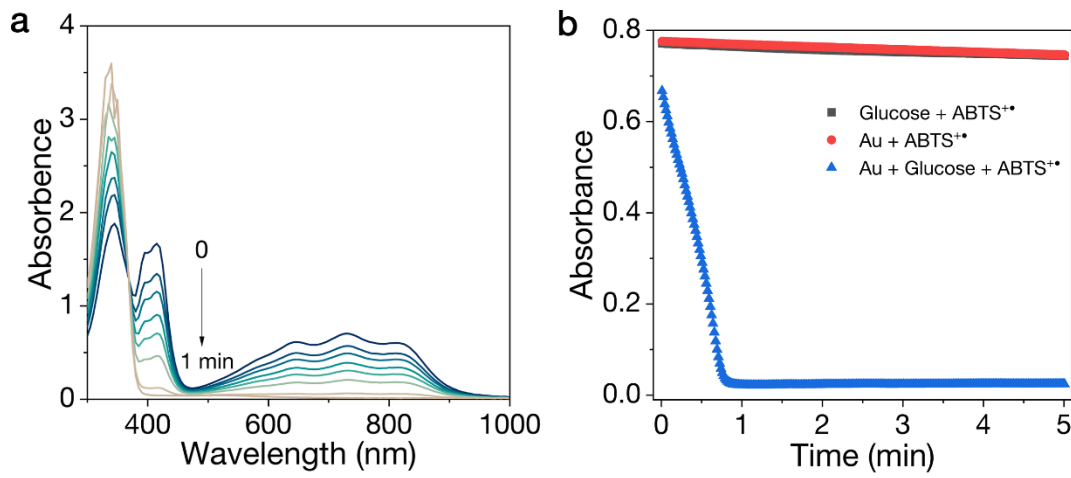
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170 **Supplementary Fig. 9. Catalytic reduction of ABTS⁺• by Au NPs. (a)**

171 UV-vis spectra of ABTS⁺• over time in the presence of Au and glucose. (b)

172 The absorption changes of ABTS⁺• at 734 nm.

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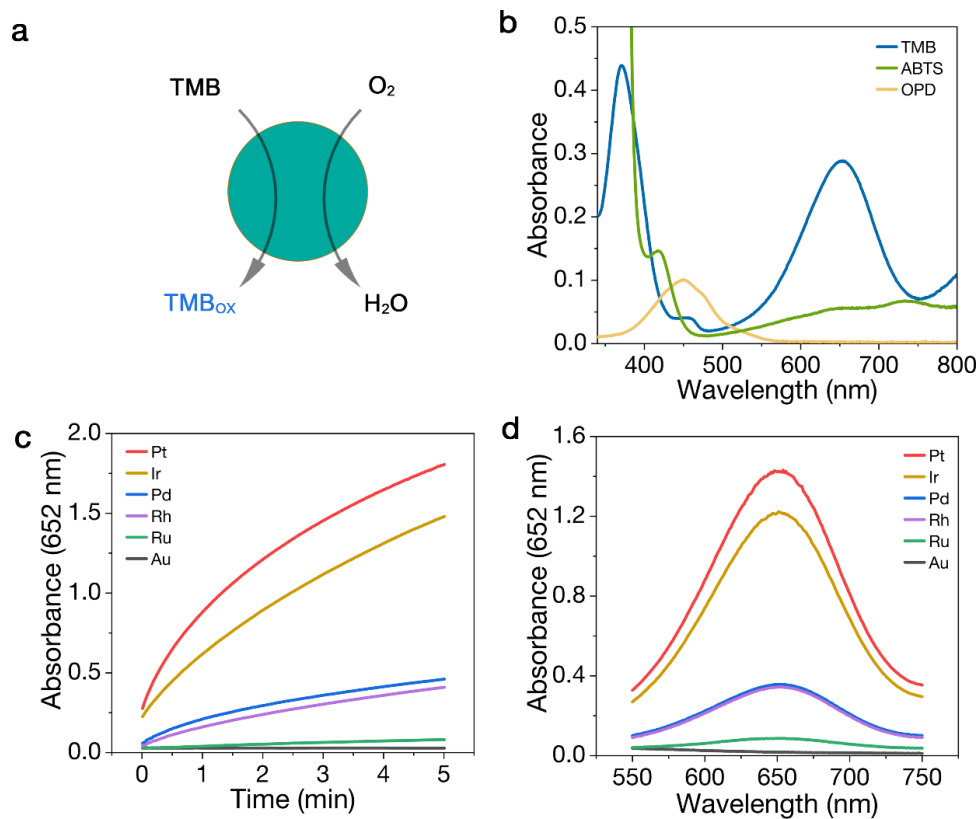
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187 **Supplementary Fig. 10. Oxidase like activities of noble metal**
 188 **nanozymes.** (a) Schematic representation of the oxidase like activity. (b)
 189 UV-vis spectra of TMB, OPD, and ABTS after oxidation. (c) Time
 190 dependent absorption changes of TMB at 652 nm in the presence of
 191 different catalysts. (d) UV-vis spectra of TMB in the presence of different
 192 catalysts.

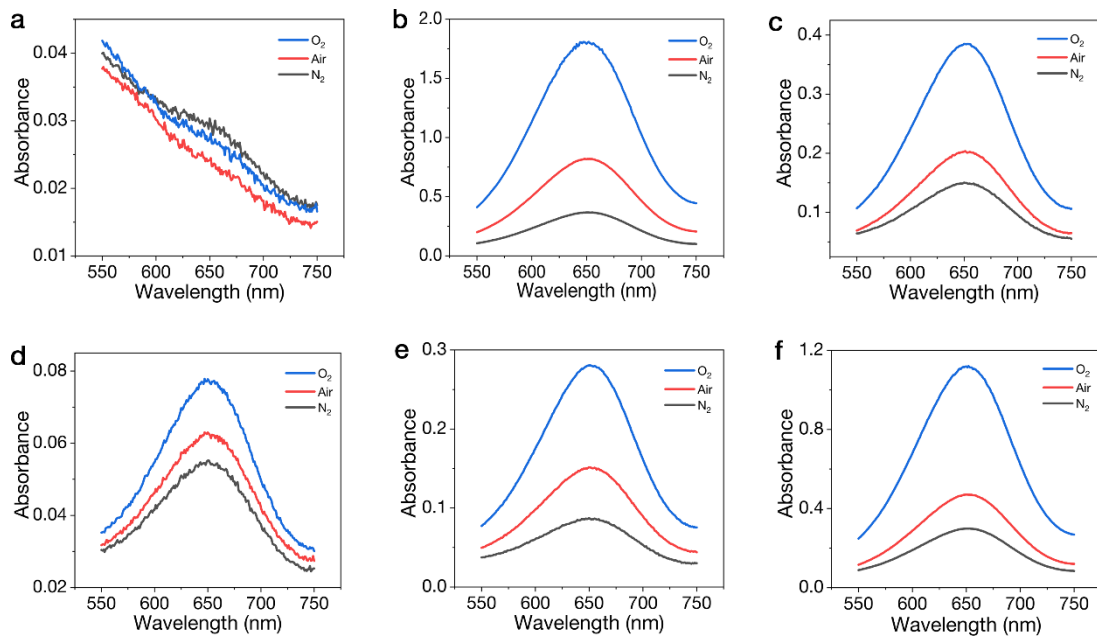
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200 **Supplementary Fig. 11. Oxidase like activities of noble metal**
201 **nanozymes.**UV-vis spectra of TMB in the presence of (a) Au, (b) Pt, (c)
202 Pd, (d) Ru, (e) Rh, and (f) Ir in different gas saturated solutions.

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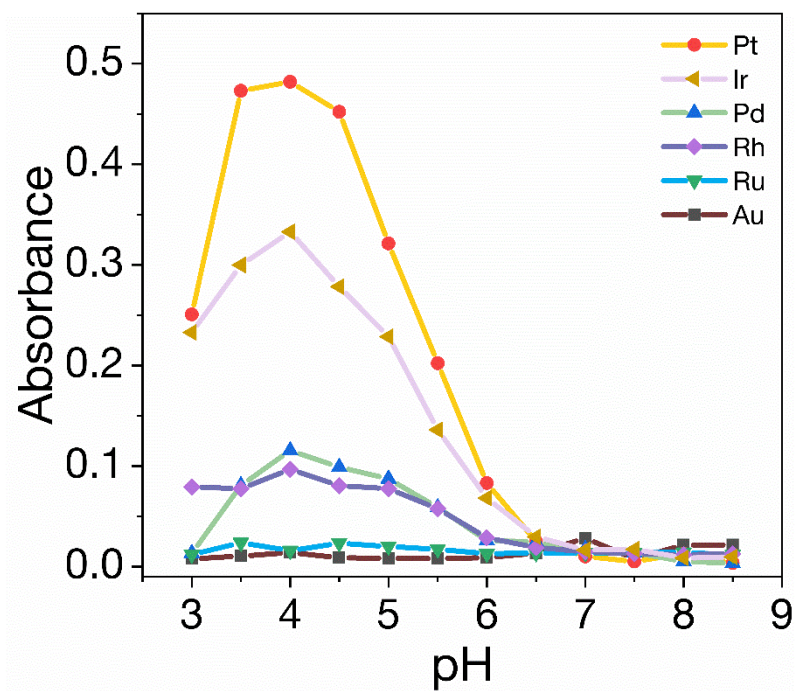
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215 **Supplementary Fig. 12.** The pH dependent oxidase-mimic activities of
216 different catalysts.

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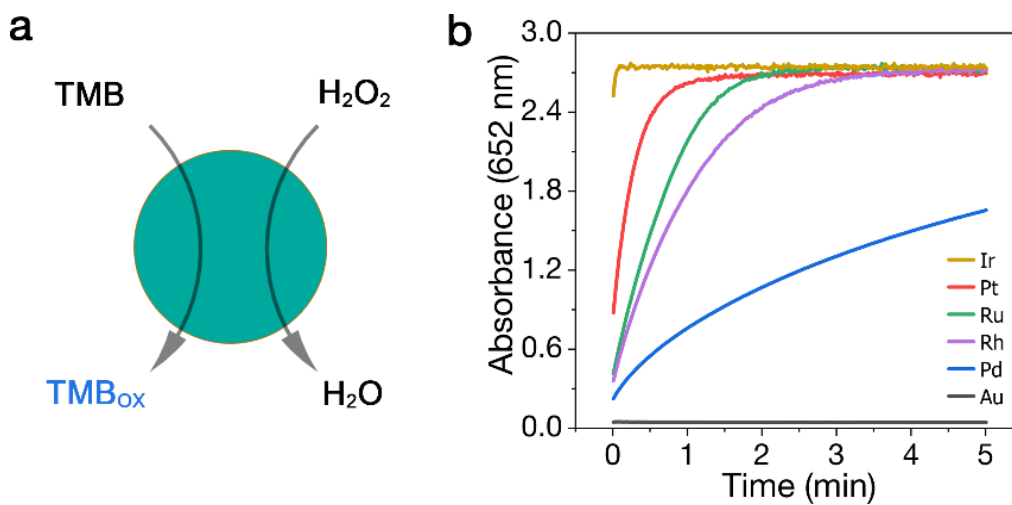
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230 **Supplementary Fig. 13. Peroxidase like activities of noble metal**

231 **nanozymes.** (a) Schematic representation of the peroxidase like activity.

232 (b) Time dependent absorption changes of TMB at 652 nm in the presence

233 of H₂O₂ and different catalysts.

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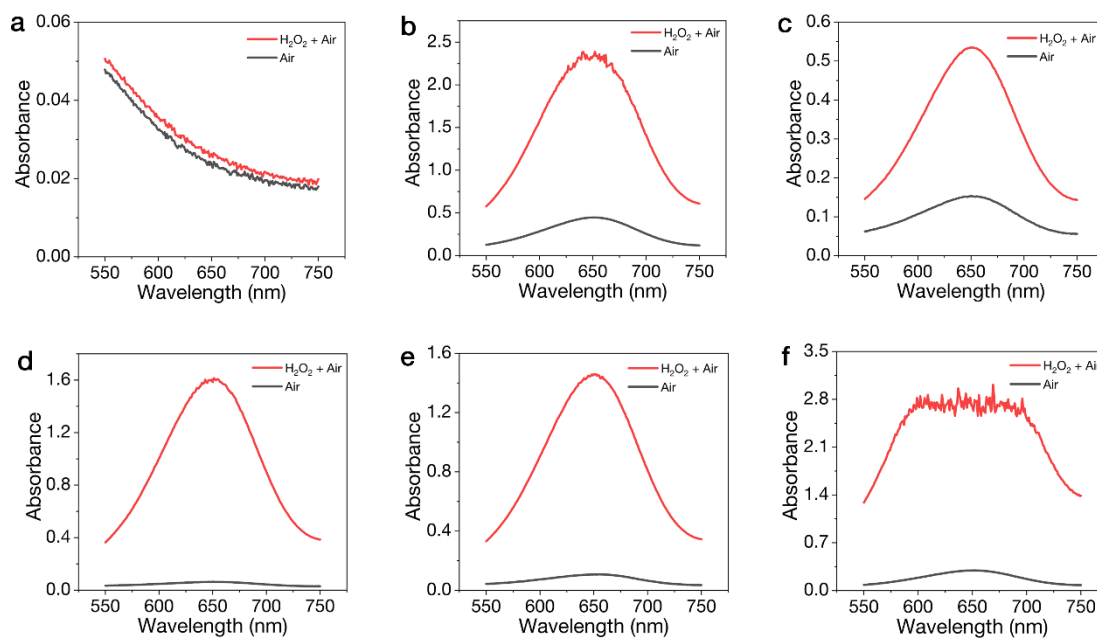
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247 **Supplementary Fig. 14. Peroxidase like activities of noble metal**

248 **nanozymes. UV-vis spectra of TMB in the presence of (a) Au, (b) Pt, (c)**

249 **Pd, (d) Ru, (e) Rh, (f) Ir under different conditions.**

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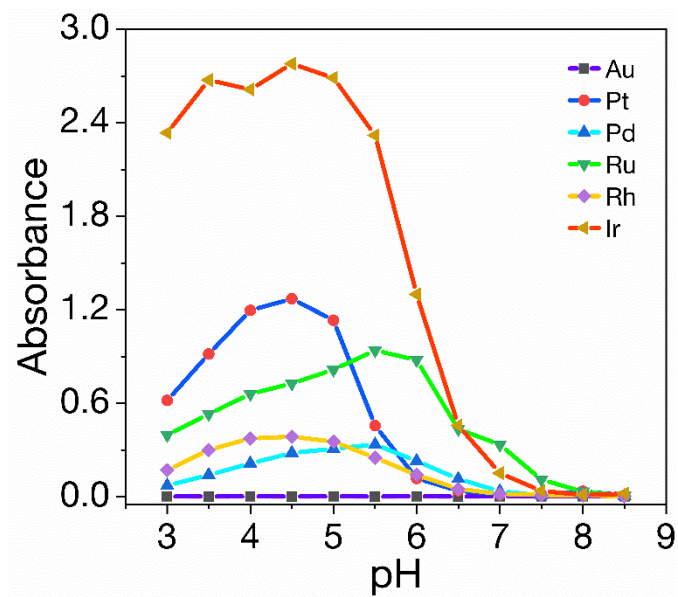
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262 **Supplementary Fig. 15.** The pH dependent peroxidase-mimic activities
263 of different catalysts.

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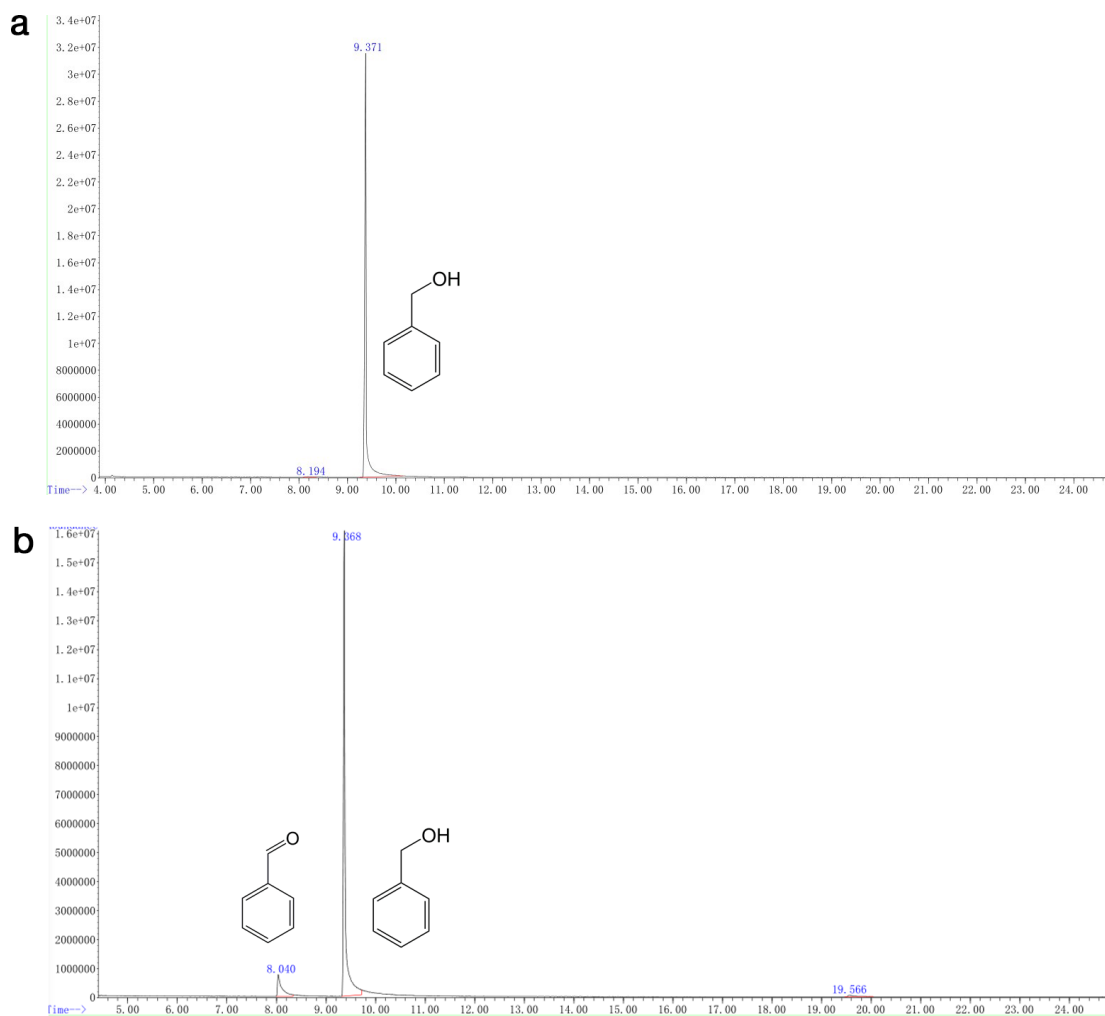
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278 **Supplementary Fig. 16.** Chromatogram of benzyl alcohol before (a) and
279 after (b) Au catalyzed oxidation reaction.

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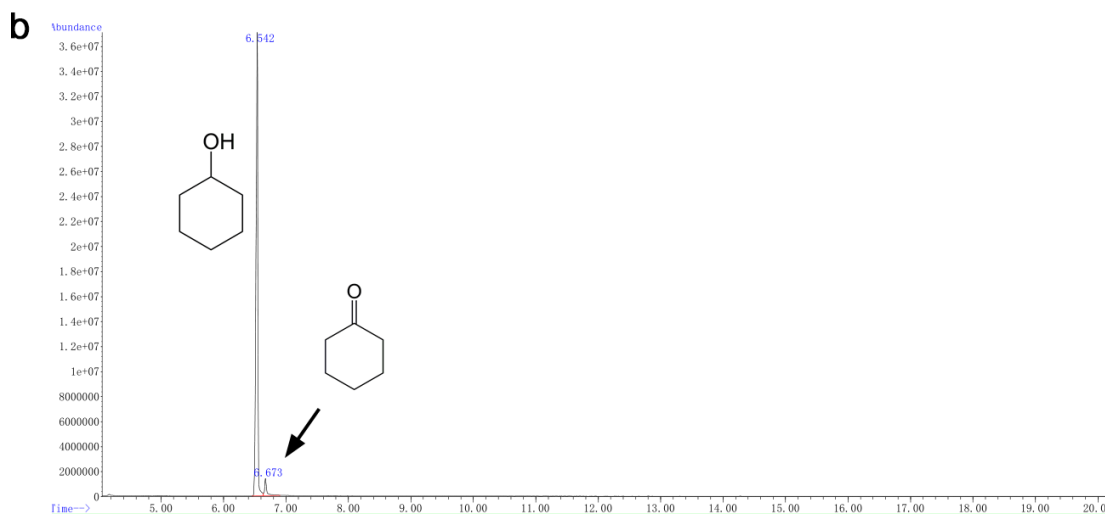
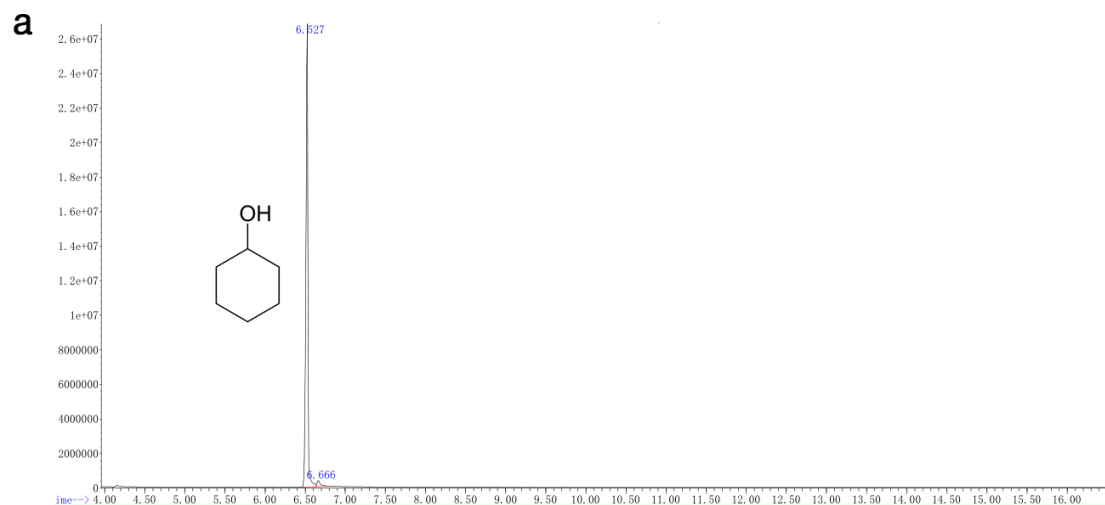
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289 **Supplementary Fig. 17.** Chromatogram of cyclohexanol before (a) and
290 after (b) Au catalyzed oxidation reaction.

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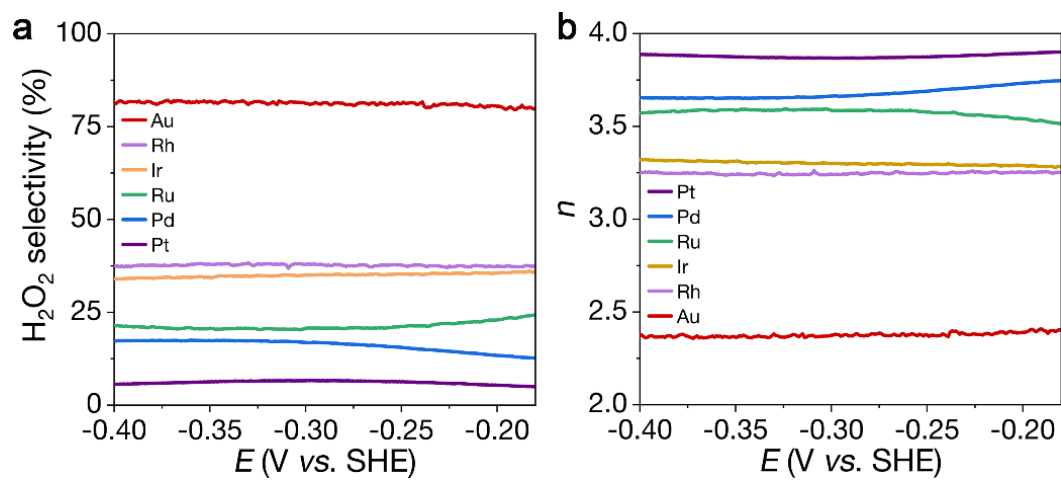
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300 **Supplementary Fig. 18. ORR performance.** (a) O_2 reduction selectivity
301 toward H_2O_2 production and the calculated values of electron transfer
302 number.

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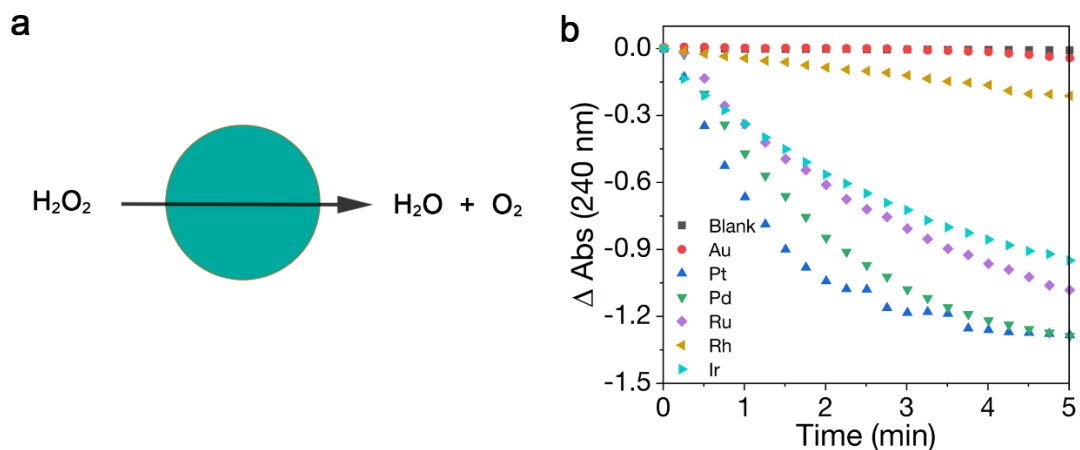
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317 **Supplementary Fig. 19. Catalase like activities of noble metal**

318 **nanozymes.** (a) Schematic representation of the catalase like activity. (b)

319 Time dependent absorption changes of H_2O_2 at 240 nm in the presence of

320 different catalysts.

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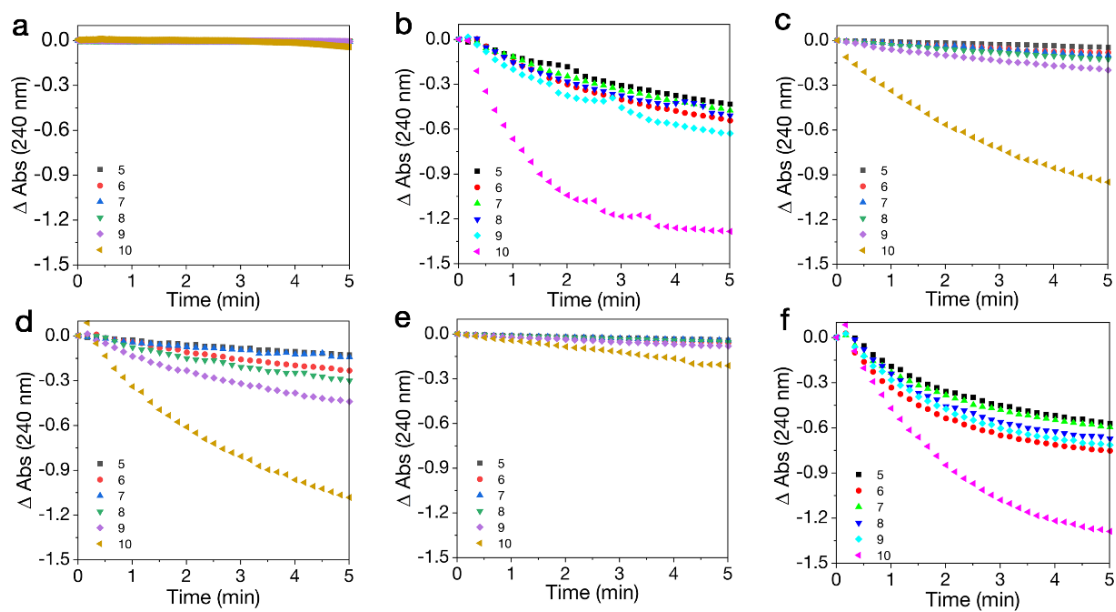
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335 **Supplementary Fig. 20. Catalase like activities of noble metal**

336 **nanozymes.** Time dependent absorption changes of H_2O_2 at 240 nm in the

337 presence of (a) Au, (b) Pt, (c) Pd, (d) Ru, (e) Rh, (f) Ir in buffer solutions

338 at different pH values.

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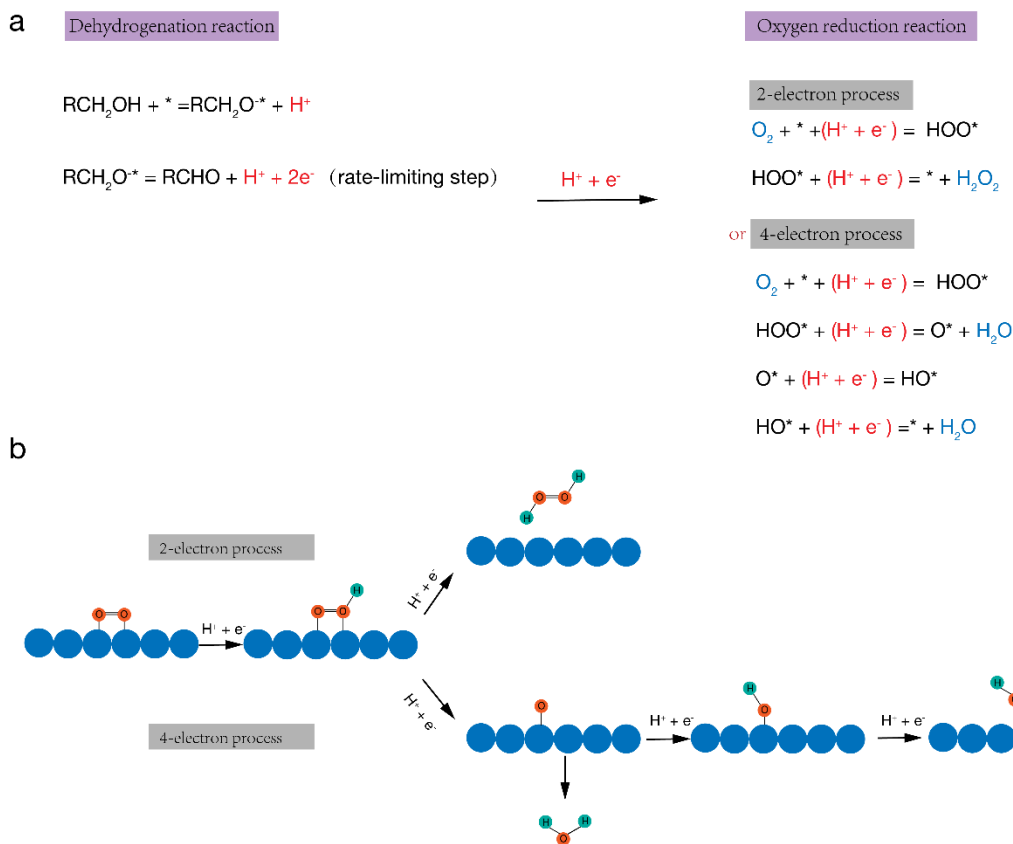
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351 **Supplementary Fig. 21. Proposed mechanism of glucose oxidation**352 **catalyzed by noble metal NPs. (a) Mechanism of glucose oxidation**353 **catalyzed by noble metal NPs. (b) The difference between 2e- path and 4e-**354 **path in oxygen reduction reaction. * denote the active sites at the surface**355 **of NPs**

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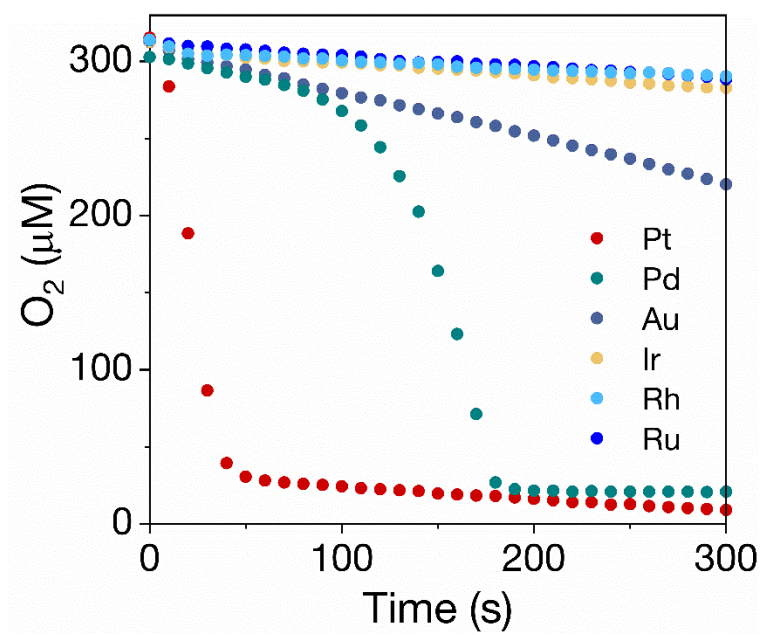
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364 **Supplementary Fig. 22. Oxygen-consumption assays.** O₂ concentrations
365 over time in the presence of HCOOK and different catalysts.

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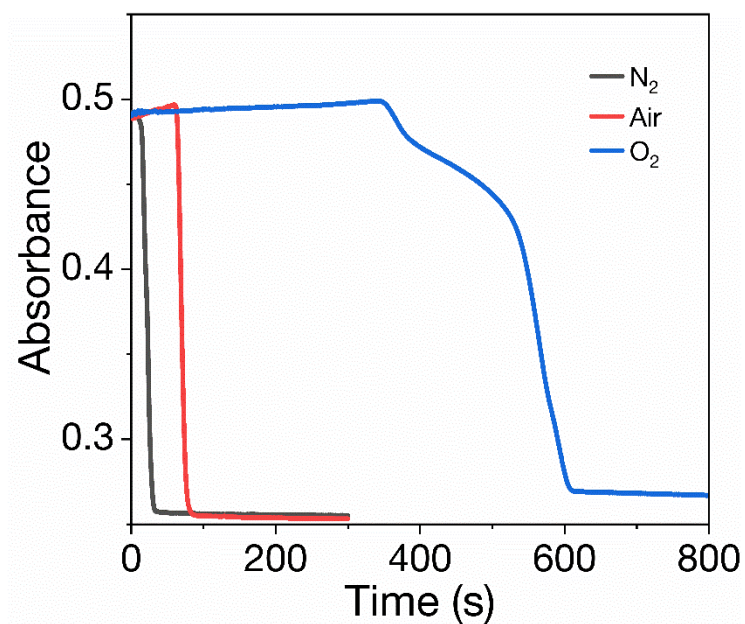
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380 **Supplementary Fig. 23. FMN reduction.** UV-visible absorption at 450
381 nm of the mixed solutions containing FMN, HCOOK, and Pt in N₂, Air,
382 and O₂-saturated buffer.

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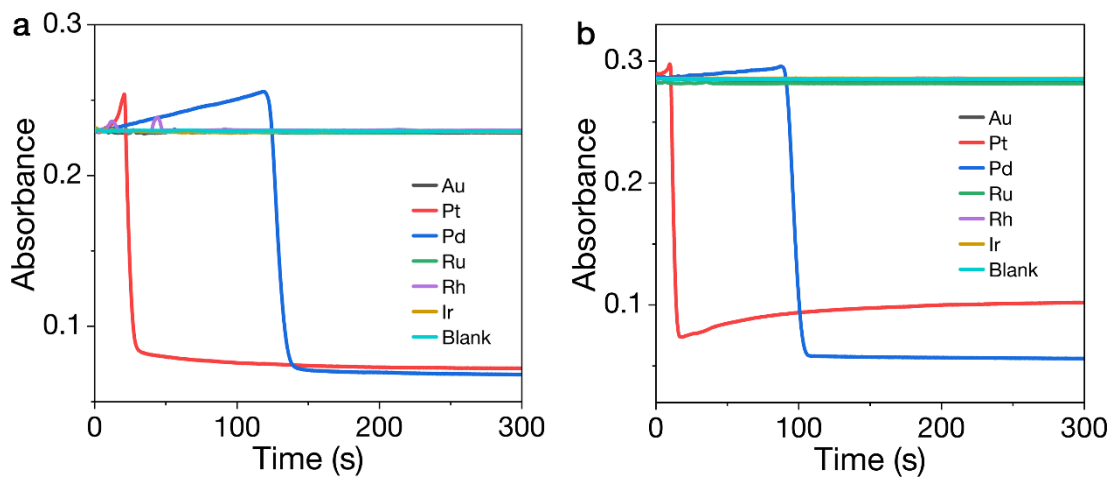
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396 **Supplementary Fig. 24. FAD reduction.** (a) UV-visible absorption of
397 FAD at 450 nm in the presence of HCOOK and different catalysts. (b) UV-
398 visible absorptions of FMN at 450 nm in the presence of HCOOK and
399 different catalysts.

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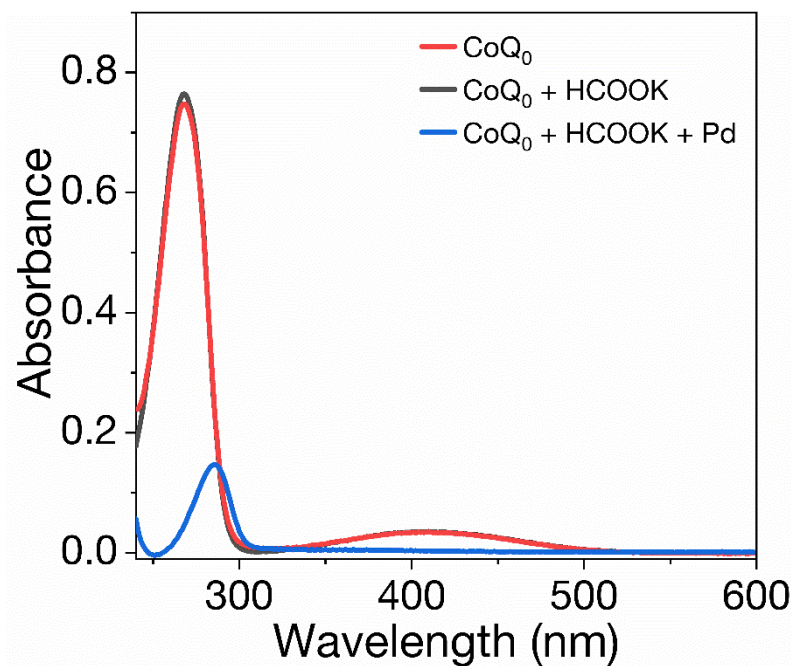
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413 **Supplementary Fig. 25. CoQ₀ reduction.** UV-visible absorption spectra

414 of CoQ₀, CoQ₀ + HCOOK, and CoQ₀ + HCOOK + Pd after reacting for 5

415 min.

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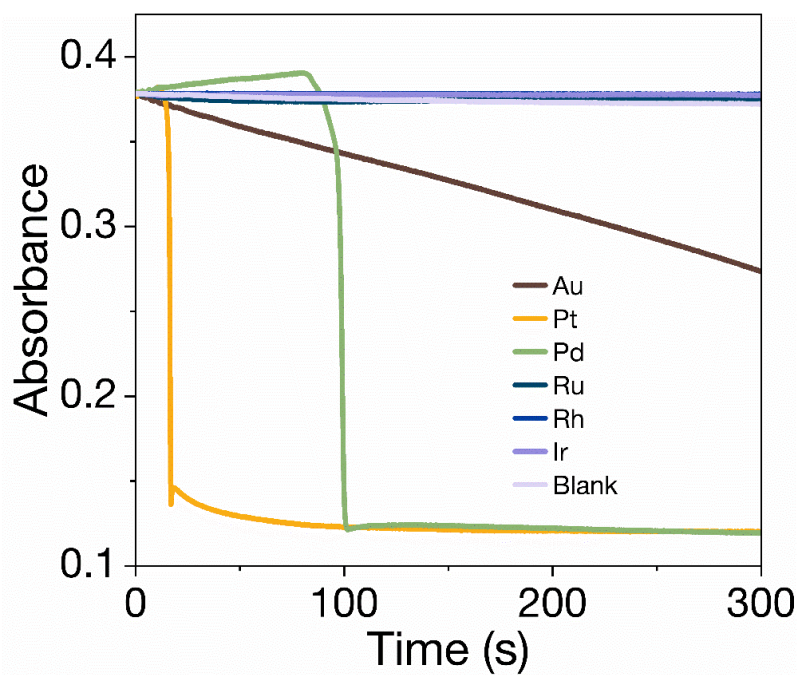
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428 **Supplementary Fig. 26. CoQ₀ reduction.** UV-visible absorptions of

429 CoQ₀ at 268 nm in the presence of HCOOK and different catalysts.

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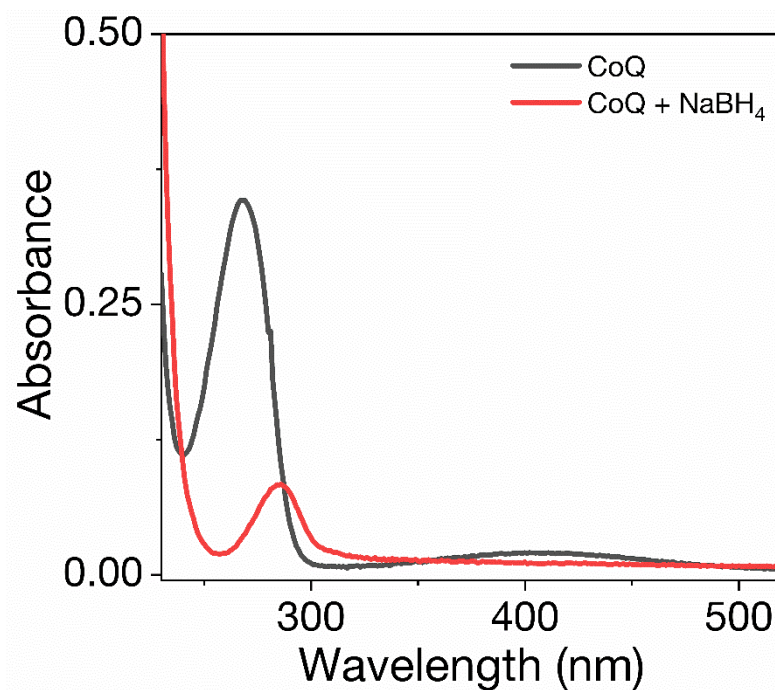
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443 **Supplementary Fig. 27. CoQ₀ reduction.** UV-visible absorption spectra
444 of CoQ₀, CoQ₀ + NaBH₄. Since NaBH₄ can reduce CoQ₀ rapidly, we have
445 not measured the catalytic effect of nanoparticles on this reaction.

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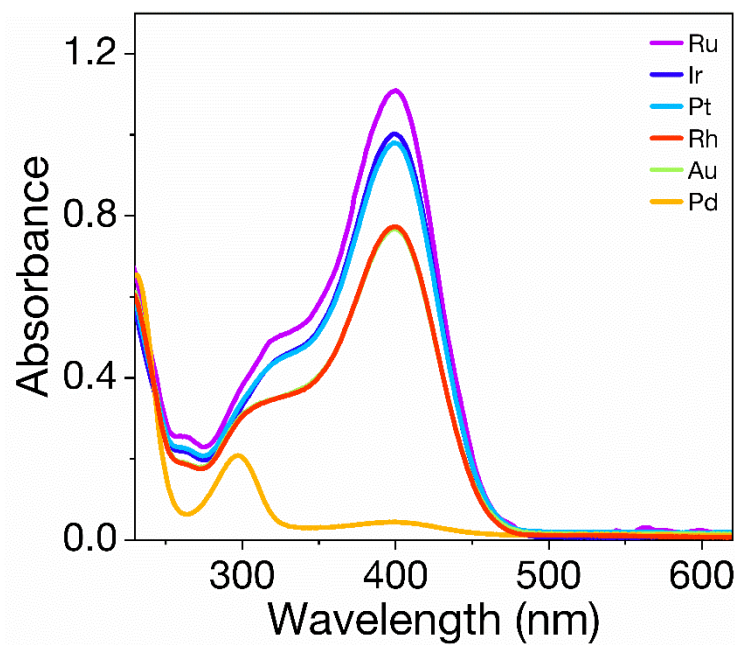
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458 **Supplementary Fig. 28. pNP reduction.**UV-visible absorption spectra of
459 pNP in the presence of NaBH₄ and different catalysts.