Mimicking Horseradish Peroxidase and Oxidase by Ruthenium Nanomaterials

Gao-Juan Cao[a,b], Xiumei Jiang[b], Hui Zhang[b], Timothy R. Croley[b] and Jun-Jie Yin[b,*]

[a]Department of Applied Chemistry, College of Life Sciences, Fujian Agriculture and Forestry University, Fuzhou, Fujian 350002, China.
[b]Division of Analytical Chemistry, Office of Regulatory Science, Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration, College Park, Maryland 20740, USA.
*Corresponding author: junjie.yin@fda.hhs.gov

$$(1)\quad H_2O_2 / O_2 \xrightarrow{NPs} 2\,{}^{\cdot}OH$$

$${}^{\cdot}OH + Substrates \longrightarrow Oxidized\ Substrates + H_2O$$

$$(2)\ Substrates - e \xrightarrow{NPs} Oxidized\ Substrates$$

$$H_2O_2 / O_2 + e \xrightarrow{NPs} H_2O$$

Scheme S1 Two most possible mechanisms responsible for the enzyme mimic activities of Ru NPs.

Table S1 Hydrodynamic size and Zeta potential of Ru NPs dispersed in water.

In H_2O	Size (DLS, nm)	PDI	Zeta potential
Ru NPs	123.2±1.9	0.16	–37.7±0.4

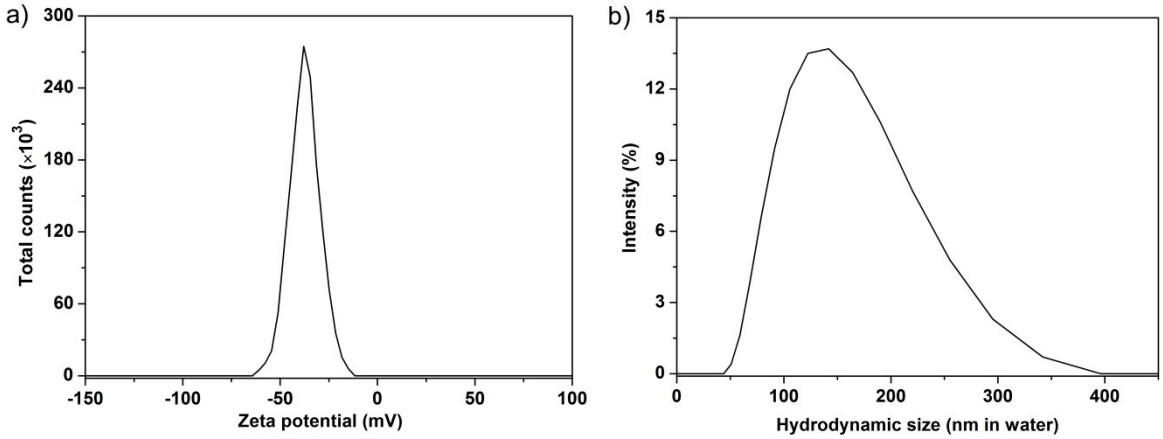

Fig. S1 Hydrodynamic size and Zeta potential measurements of Ru NPs in water.

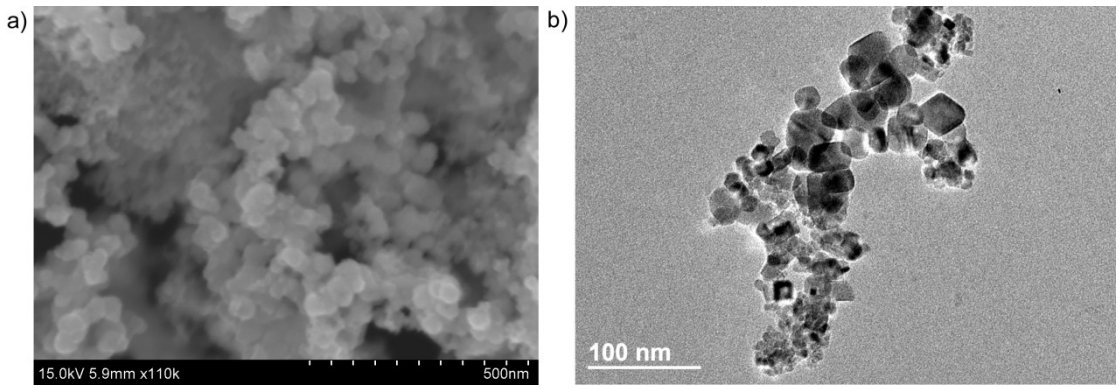

Fig.S2 SEM and TEM images of Ru NPs.

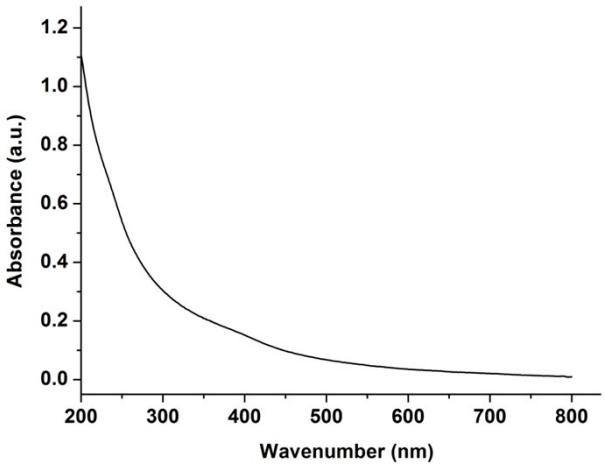

Fig.S3 UV-Vis absorption spectra of Ru NPs.

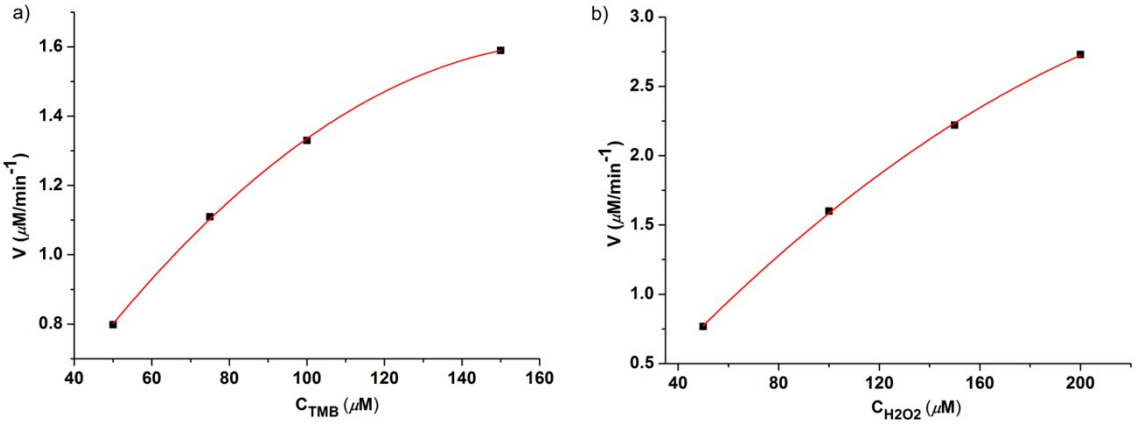

Fig.S4 The velocity of the HRP-like reaction changes in the presence of different concentrations of TMB (a) and H_2O_2 (b).

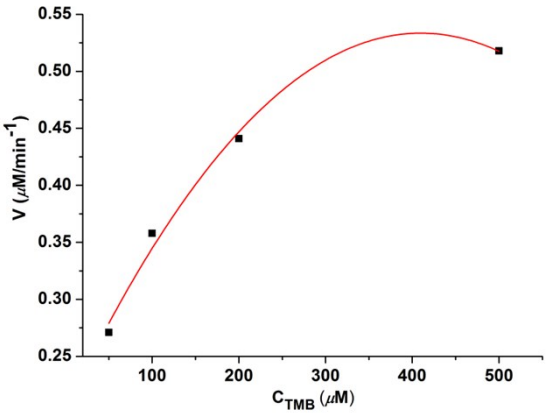

Fig.S5 The velocity of the oxidase-like reaction changes in the presence of different concentrations of TMB.

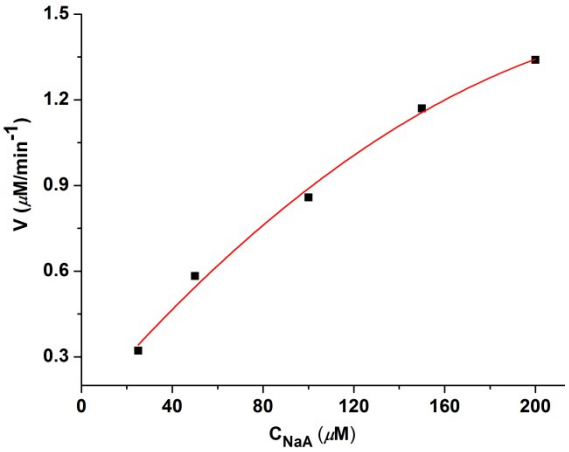

Fig.S6 The velocity of the oxidase-like reaction changes in the presence of different concentrations of NaA.

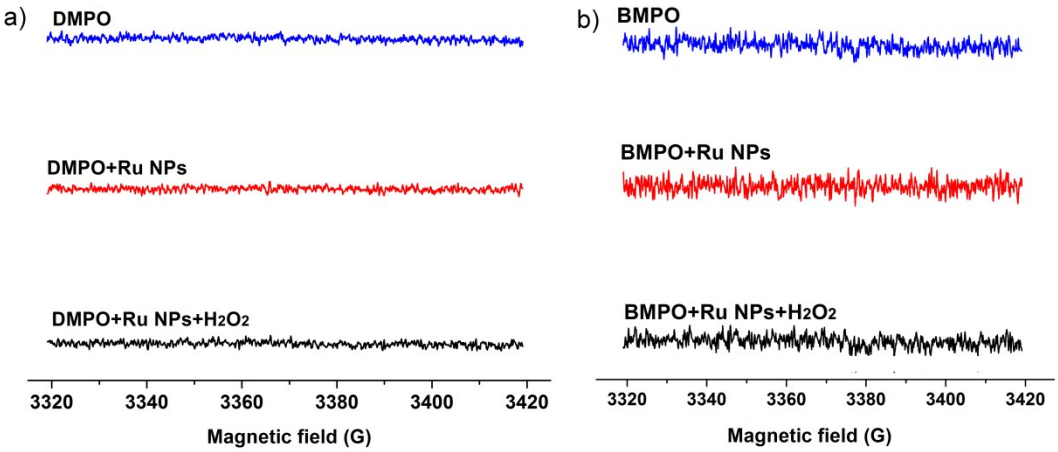

Fig.S7 a) ESR spectra of Ru NPs in DMPO or H_2O_2/DMPO system. b) ESR spectra of Ru NPs in BMPO or H_2O_2/BMPO system. There is no ESR signal of DMPO−OH or BMPO−OH adduct, which exhibits a typical quartet with an intensity ratio of 1:2:2:1.