A SERS nanocatalytic reaction and its application to quantitative analysis of trace Hg(II) with Vitoria blue B molecular probe

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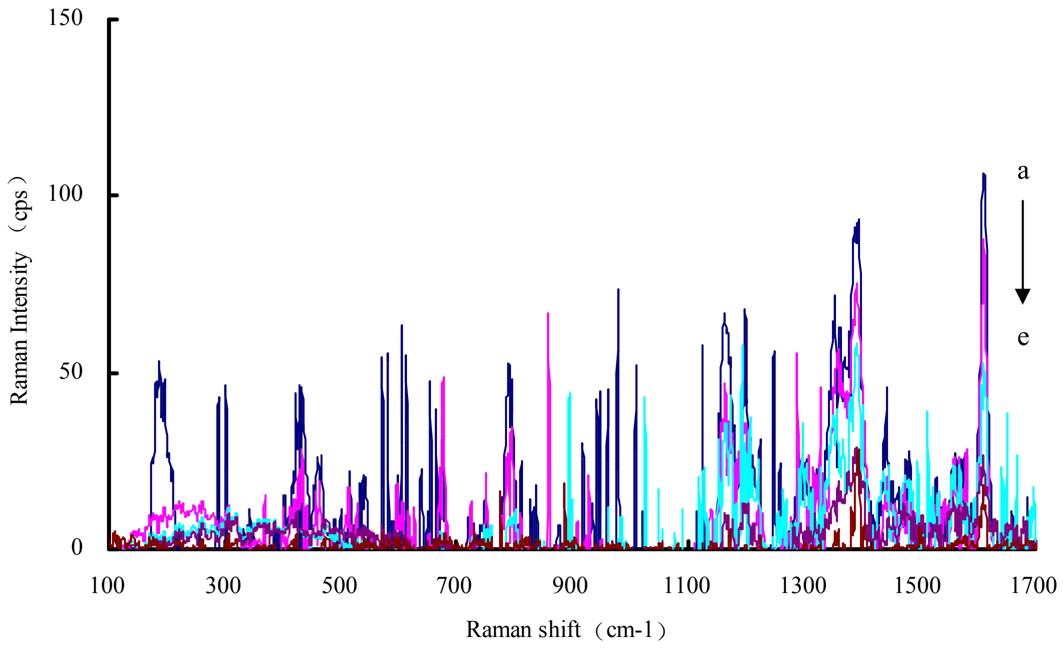


Figure S1 SERS spectra of the Hg^{2+}-AuNPs-NaH_2PO_2-VBB system

a: 5.7μg/ml AuNPs +67.5mmol/L CH_3COOH +50 mmol/L NaH_2PO_2, reaction time 15min at 60 °C, +1.0 μmol/L VBB; b: a+50nmol/L $HgCl_2$; c:a+125nmol/L $HgCl_2$; d:a+250nmol/L $HgCl_2$; e:a+375nmol/L $HgCl_2$.

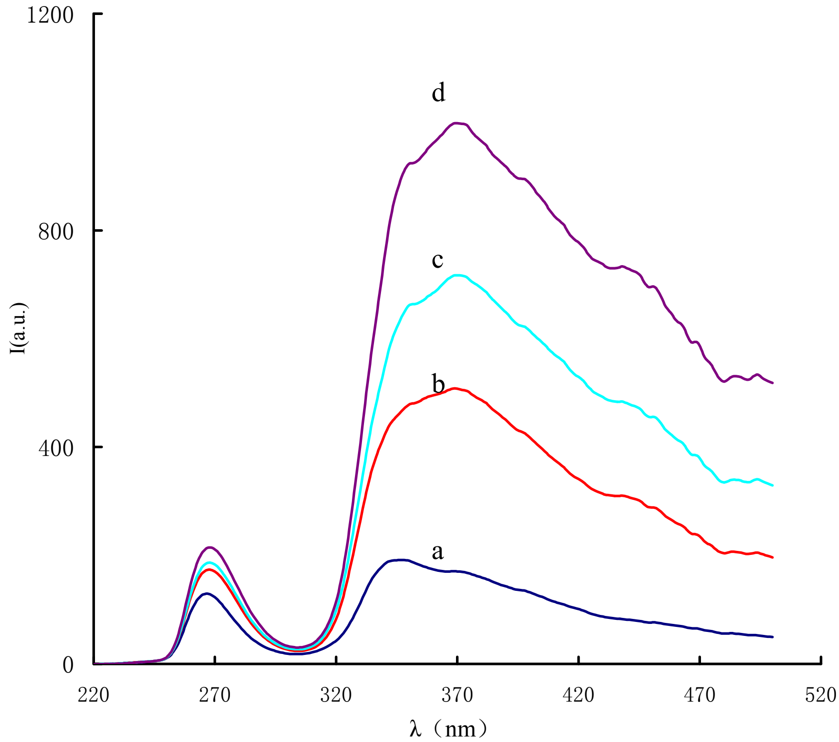


Figure S2 RRS spectra of the Hg^{2+}-NaH_2PO_2 system

a: 0.225 mol/L HCl+0.188mol/L NaH_2PO_2; b: a+1000nmol/L Hg^{2+}; c: a+2000nmol/L Hg^{2+}; d: a+3000 nmol/L Hg^{2+}.

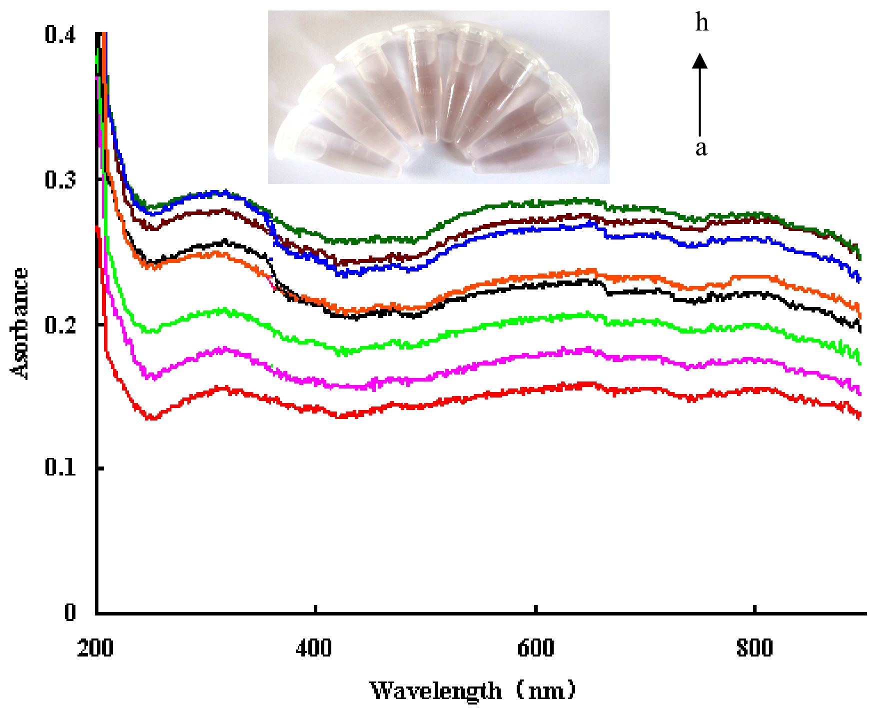


Figure S3 Absorption spectra of the Hg^{2+}-$HAuCl_4$-NaH_2PO_2system

a: 120μmol/L $HAuCl_4$+0.225mol/L HCl +0.188mol/L NaH_2PO_2; b:a+25nmol/L $HgCl_2$;

c:a+50nmol/L $HgCl_2$; d:a+125nmol/L $HgCl_2$; e:a+150nmol/L $HgCl_2$; f:a+250nmol/L $HgCl_2$ g:a+300nmol/L $HgCl_2$; h:a+350nmol/L $HgCl_2$.

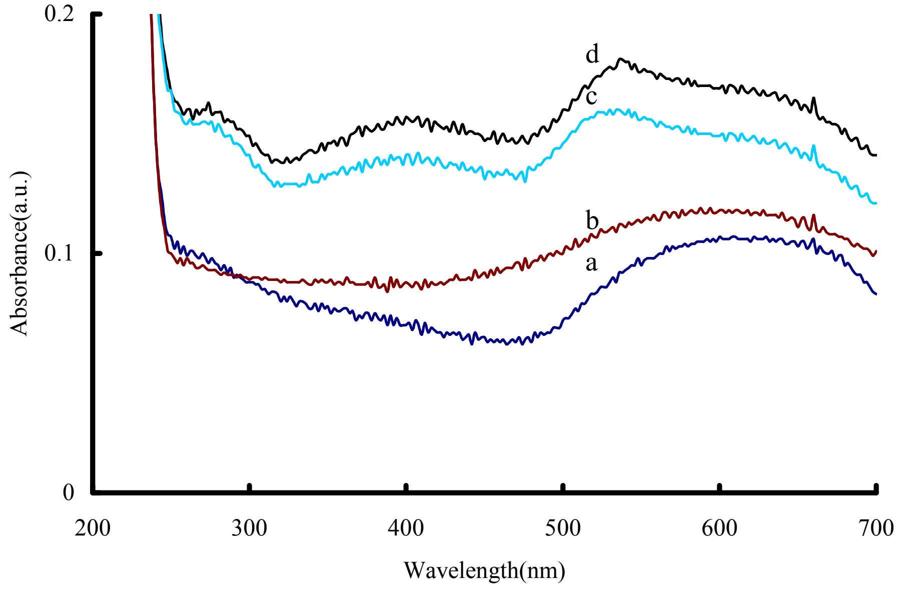


Figure S4 Absorption spectra of the Hg^{2+}-AuNPs-NaH_2PO_2system

a: 5.7μg/ml AuNPs +67.5mmol/L CH_3COOH + 25mmol/L NaH_2PO_2, reaction time 15min at 60 °C; b:a+0.25μmol/L $HgCl_2$; c:a+0.5 μmol/L $HgCl_2$; d: a+0.75μmol/L $HgCl_2$; e:a+1μmol/L $HgCl_2$.

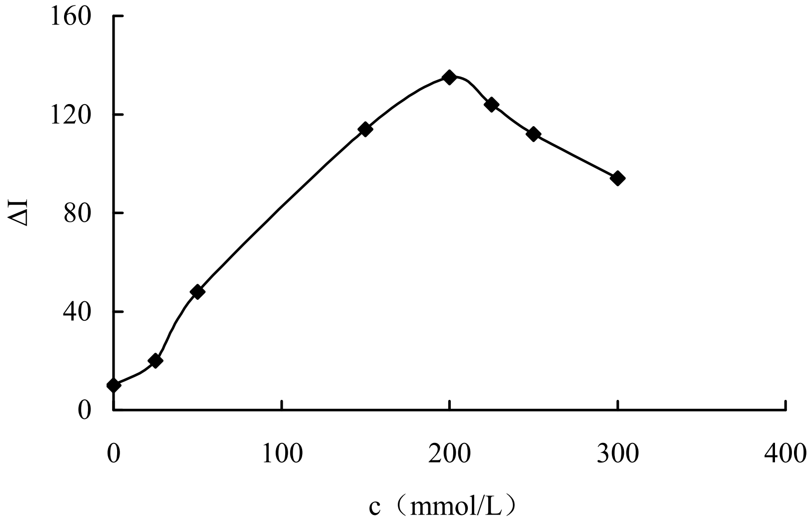


Figure S5 Effect of HCl concentration on the Δ*I*

120μmol/L $HAuCl_4$+0.188mol/L NaH_2PO_2+20nmol/L $HgCl_2$+ 1μmol/L VBB

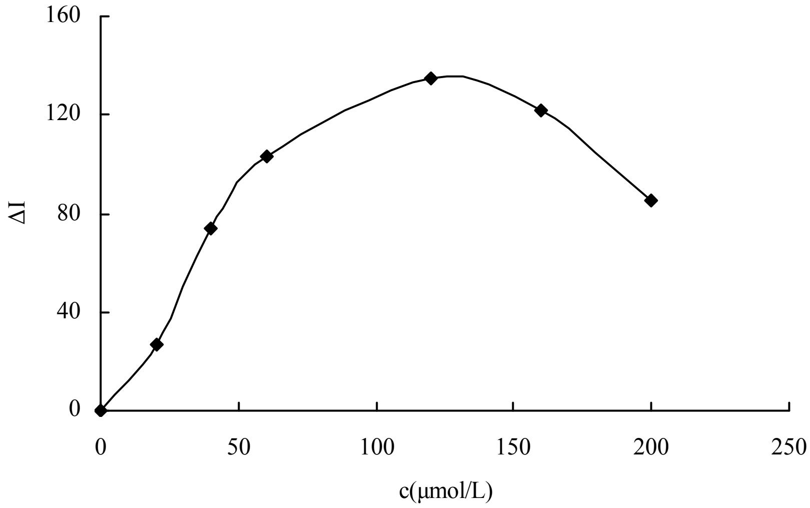


Fig. S6 Effect of $HAuCl_4$ concentration on the Δ*I*

0.225mmol/L HCl +20nmol/L $HgCl_2$+0.188mol/L NaH_2PO_2+ 1μmol/L VBB

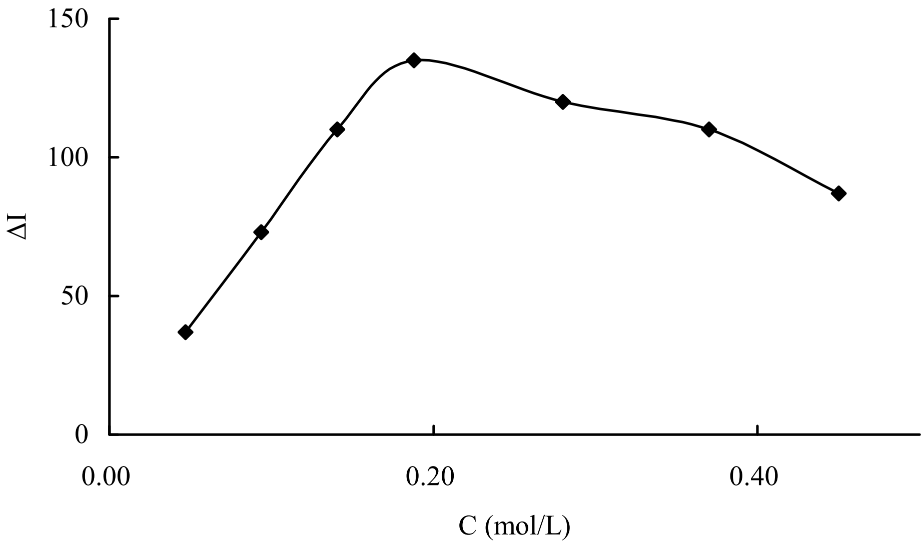


Fig. S7 Effect of NaH_2PO_2 concentration on the Δ*I*

0.225mmol/L HCl +20nmol/L $HgCl_2$+ 120μmol/L $HAuCl_4$+1μmol/L VBB

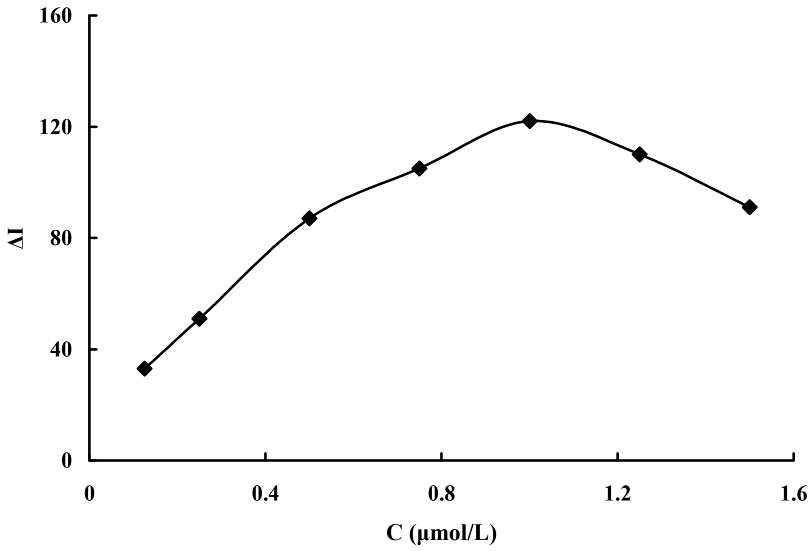
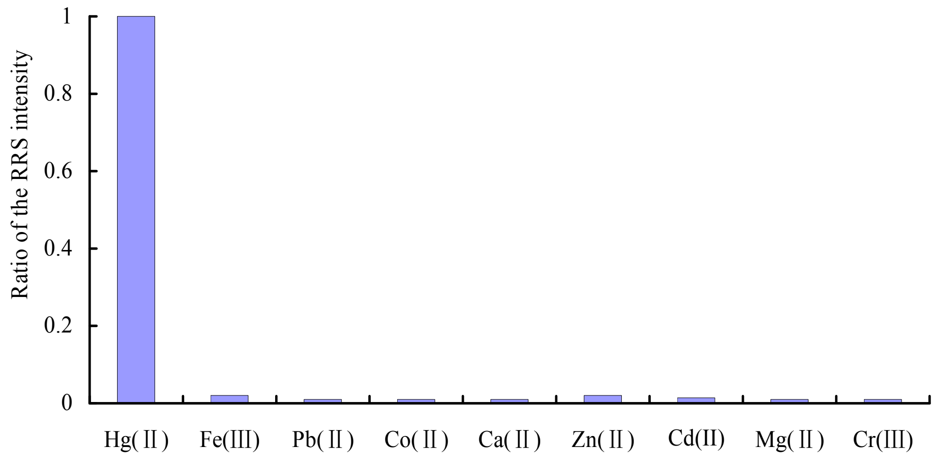


Figure S8 Effect of VBB concentration on the Δ*I*

0.225 mmol/L HCl + 120μmol/L $HAuCl_4$+0.188mol/L NaH_2PO_2+20 nmol/L $HgCl_2$



Metal ions

Figure S9 Metal ion catalytic enhancement on the AuNP particle reaction

0.225 mol/L HCl+50nmol/L $HgCl_2$+120μmol/L $HAuCl_4$+0.188 NaH_2PO_2+ 1.0 μmol/L VBB. Ratio = $[(I)_{Hg}-(I)_{Hg+MI}]/(I)_{Hg}$, the MI represents metal ion.

Table S1 Catalysis of AuNPs on the particle reaction

Size (nm)	Regress equation	Linear range (μmol/L)	Coefficient
10	ΔI =19.1C_{AuNP} + 12.5	0.1-10	0.9849
30	ΔI =17.5 C_{AuNP} + 51.5	0.2-15	0.9739
50	ΔI =13.8 C_{AuNP} + 40.7	0.4-15	0.9876
70	ΔI =9.7 C_{AuNP} + 75.6	0.5-15	0.8974

Table S2 The comparing of analytical features for Hg(II)

System	Method	Regress equation	LR (nmol/L)	Coefficient	DL (nmol/L)
Au(III)-NaH_2PO_2-VBB	SERS	ΔI =5.18C + 9.2	3.0-150	0.9890	0.8
Au(III)-NaH_2PO_2	RRS	ΔI=13.9C + 34.2	10-100	0.9925	5.0
AuNP-NaH_2PO_2-VBB	SERS	ΔI=0.66C + 2.8	25-125	0.9832	10
AuNP-NaH_2PO_2	RRS	ΔI= 2.21C - 247	250-2000	0.9932	150