Supporting Information

Revisiting Background Signals and the Electrochemical Windows of Au, Pt, and GC Electrodes in Biological Buffers

Bo-Chang Lai,[†] Jhih-Guang Wu,[†] and Shyh-Chyang Luo*,[†,‡]

[†]Department of Materials Science and Engineering, National Taiwan University, No. 1, Sec. 4, Roosevelt Road, Taipei 10617, Taiwan

[‡]Advanced Research Center for Green Materials Science and Technology, National Taiwan University, No. 1, Sec. 4, Roose-velt Road, Taipei 10617, Taiwan

Email: shyhchyang@ntu.edu.tw

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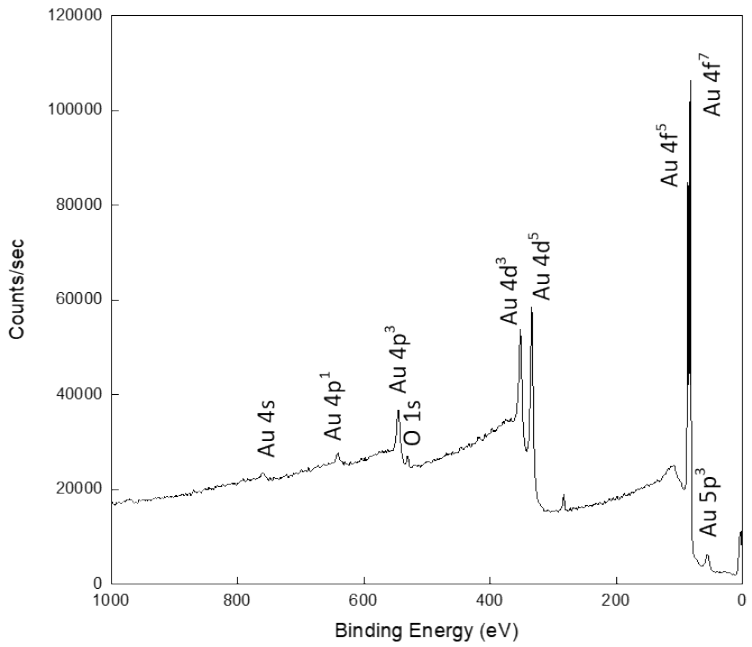

Figure S1. The XPS survey of a Au electrode after a linear sweep potential from -0.4 to 2.0 V (vs RHE) was applied in Tris buffer (pH = 8.0).

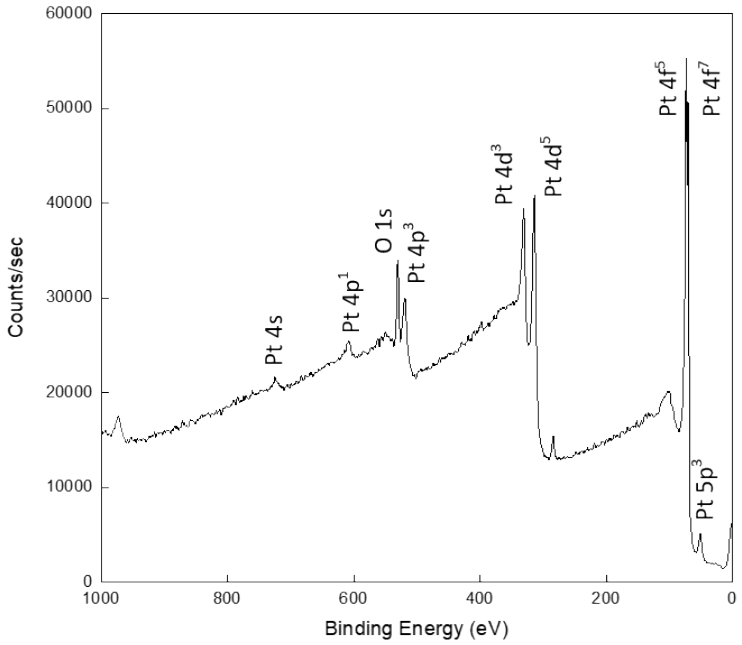

Figure S2. The XPS survey of a Pt electrode after a linear sweep potential from -0.4 to 2.0 V (vs RHE) was applied in Tris buffer (pH = 8.0).

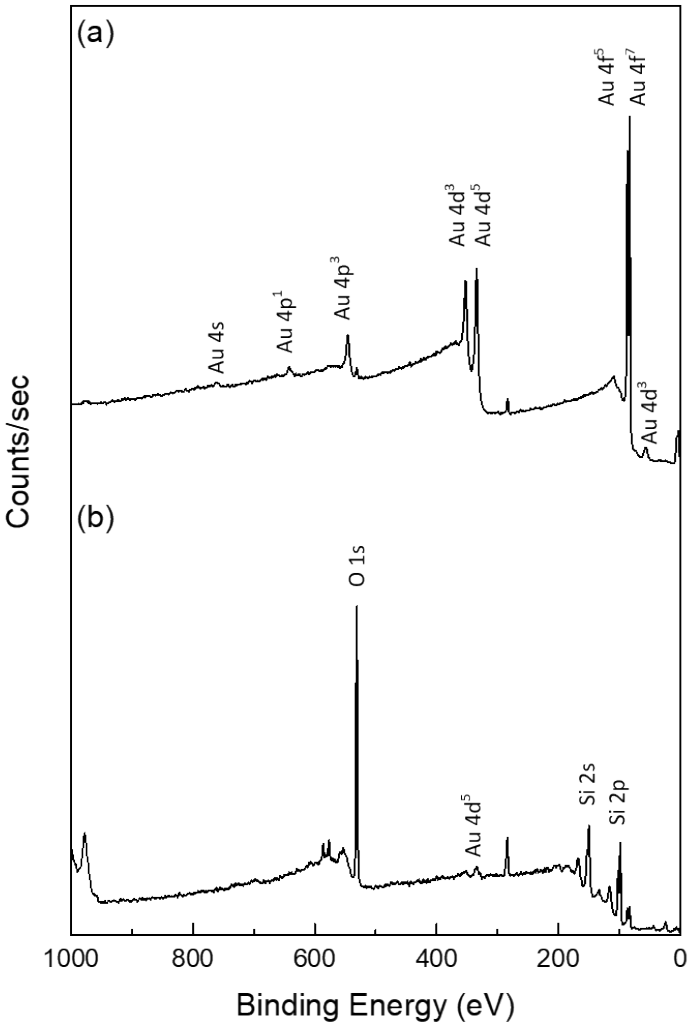

Figure S3. The XPS data of (a) pristine Au surface and (b) Au surface after 5 cycles of cyclic potential applied in Tris buffer at pH = 6.0 (HCl for pH modulation).

Table S1. Redox potential of gold, GC, and platinum in Tris buffer solution. (*Note.* Ox: oxidation; Red reduction.)

W.E.	pH	Acid or base for adjusting pH	Surface redox (V vs RHE)	OH^- oxidation (V vs RHE)	Other reaction (V vs RHE)
Gold	6.0	H_2SO_4	Ox : not obvious Red : 0.88	Not obvious	
Gold	7.0	H_2SO_4	Ox : 0.91 Red : 0.68	1.56	
Gold	8.0	H_2SO_4	Ox : 0.89 Red : 0.58	1.74	
Gold	9.0	H_2SO_4	Ox: 0.72 Red : 0.49	2.10	
GC	6.0	H_2SO_4	N/A	Not obvious	
GC	7.0	H_2SO_4	N/A	Not obvious	
GC	8.0	H_2SO_4	N/A		
GC	9.0	H_2SO_4	N/A	1.72	
Platinum	6.0	H_2SO_4	Ox : not obvious Red : 0.36	1.82	
Platinum	7.0	H_2SO_4	Ox : not obvious Red : 0.36/0.06	0.99	
Platinum	8.0	H_2SO_4	Ox : not obvious Red : -0.04	1.82	
Platinum	9.0	H_2SO_4	Ox : not obvious Red : -0.10	0.99	
Gold	6.0	HCl	Ox : no Red : 0.70	Not obvious	Ox : 1.54 $Au_{(s)} + 2\ Cl^- \rightleftharpoons AuCl_2^- + e^-$
Gold	7.0	HCl	Ox : 1.08 Red: 0.70	Not obvious	Ox : 1.39 $Au_{(s)} + 2\ Cl^- \rightleftharpoons AuCl_2^- + e^-$
Gold	8.0	HCl	Ox : 0.91 Red : 0.59	1.82	
Gold	9.0	HCl	Ox : 0.81 Red : 0.49	2.18	
GC	6.0	HCl	N/A	Not obvious	
GC	7.0	HCl	N/A	1.72	
GC	8.0	HCl	N/A	1.83	

GC	9.0	HCl	N/A	2.26	
Platinum	6.0	HCl	Ox : not obvious Red : 0.28	Not obvious	Ox : 1.54 $Pt_{(s)} + 4\ Cl^- \rightleftharpoons PtCl_4^{2-} + 2\ e^-$
Platinum	7.0	HCl	Ox : not obvious Red : 0.05	1.47	
Platinum	8.0	HCl	Ox : not obvious Red : -0.06	1.80	
Platinum	9.0	HCl	Ox : not obvious Red : -0.10	2.15	

Table S2. Redox potential of gold, GC, and platinum in HEPES buffer solution. (*Note.* Ox: oxidation; Red reduction.)

W.E.	pH	Acid or base for adjusting pH	Surface redox (V vs RHE)	OH^- oxidation (V vs RHE)	Other reaction (V vs RHE)
Gold	6.0	NaOH	Not obvious	Not obvious	
Gold	7.0	NaOH	Ox : 0.56 Red: 0.52	0.99	
Gold	8.0	NaOH	Ox : no Red : 0.59	0.95	
Gold	9.0	NaOH	Ox : 0.81 Red : 0.49	0.95	
GC	6.0	NaOH	N/A	Not obvious	
GC	7.0	NaOH	N/A	1.18	
GC	8.0	NaOH	N/A	1.46	
GC	9.0	NaOH	N/A	1.43	
Platinum	6.0	NaOH	Ox : not obvious Red : 0.15	Not obvious	
Platinum	7.0	NaOH	Ox : not obvious Red : 0.18	Not obvious	
Platinum	8.0	NaOH	Ox : not obvious Red : 0.14	Not obvious	
Platinum	9.0	NaOH	Ox : not obvious Red : 0.08	Not obvious	

Table S3. Redox potential of gold, GC, and platinum in phosphate buffer solution. (*Note.* Ox: oxidation; Red reduction.)

W.E.	pH	Acid or base for adjusting pH	Surface redox (V vs RHE)	OH^- oxidation (V vs RHE)	Other reaction (V vs RHE)
Gold	6.0	H_2SO_4	Oxidation : 1.20 Red : 0.15/0.72	1.76	
Gold	7.0	H_2SO_4	Oxidation : no Red : 0.13/0.64	1.82	
Gold	8.0	H_2SO_4	Oxidation : no Red : -0.13/0.23/0.38	1.61	
Gold	9.0	H_2SO_4	Oxidation : no Red : -0.11/0.25/0.41	1.64	
GC	6.0	H_2SO_4	N/A	Not obvious	
GC	7.0	H_2SO_4	N/A	1.70	
GC	8.0	H_2SO_4	N/A	Not obvious	
GC	9.0	H_2SO_4	N/A	Not obvious	
Platinum	6.0	H_2SO_4	Ox : not obvious Red : 0.19	1.62	
Platinum	7.0	H_2SO_4	Ox : not obvious Red : 0.14	1.79	
Platinum	8.0	H_2SO_4	Ox : not obvious Red : 0.11	1.83	
Platinum	9.0	H_2SO_4	Ox : not obvious Red : 0.11	1.87	

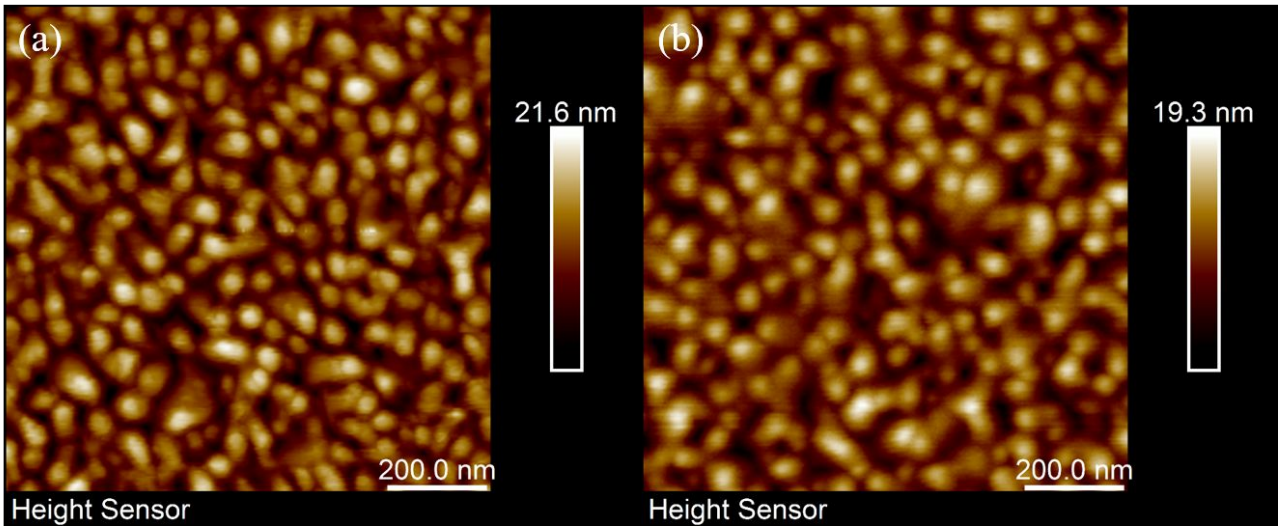

Figure S4. The AFM images of Au film which is (a) before and (b) after 50 cycles CV in pH value 8 phosphate buffer solutions.

Table S4. Electrochemical window of different electrodes in Tris, HEPES, phosphate buffer solutions.

Buffer	Working Electrode	pH	Acid or base for adjusting pH	Electrochemical window (V vs RHE)
Tris	Gold	6.0	H_2SO_4	-0.40 to 1.30
Tris	Gold	7.0	H_2SO_4	-0.40 to 1.25
Tris	Gold	8.0	H_2SO_4	-0.40 to 1.20
Tris	Gold	9.0	H_2SO_4	-0.40 to 1.20
Tris	Glassy carbon	6.0	H_2SO_4	-0.40 to 1.20
Tris	Glassy carbon	7.0	H_2SO_4	-0.40 to 1.20
Tris	Glassy carbon	8.0	H_2SO_4	-0.40 to 1.20
Tris	Glassy carbon	9.0	H_2SO_4	-0.40 to 1.20
Tris	Platinum	6.0	H_2SO_4	-0.40 to 1.05
Tris	Platinum	7.0	H_2SO_4	-0.40 to 1.00
Tris	Platinum	8.0	H_2SO_4	-0.40 to 0.90
Tris	Platinum	9.0	H_2SO_4	-0.40 to 0.90
Tris	Gold	6.0	HCl	-0.40 to 1.00
Tris	Gold	7.0	HCl	-0.40 to 1.00
Tris	Gold	8.0	HCl	-0.40 to 1.35
Tris	Gold	9.0	HCl	-0.40 to 1.30
Tris	Glassy carbon	6.0	HCl	-0.40 to 1.20
Tris	Glassy carbon	7.0	HCl	-0.40 to 1.40
Tris	Glassy carbon	8.0	HCl	-0.40 to 1.40
Tris	Glassy carbon	9.0	HCl	-0.40 to 1.40
Tris	Platinum	6.0	HCl	-0.40 to 1.35
Tris	Platinum	7.0	HCl	-0.40 to 1.20
Tris	Platinum	8.0	HCl	-0.40 to 1.20
Tris	Platinum	9.0	HCl	-0.40 to 1.20
HEPES	Gold	6.0	NaOH	-0.40 to 0.95
HEPES	Gold	7.0	NaOH	-0.40 to 0.95
HEPES	Gold	8.0	NaOH	-0.40 to 0.90
HEPES	Gold	9.0	NaOH	-0.40 to 1.00
HEPES	Glassy carbon	6.0	NaOH	-0.40 to 1.00
HEPES	Glassy carbon	7.0	NaOH	-0.40 to 1.00
HEPES	Glassy carbon	8.0	NaOH	-0.40 to 1.00
HEPES	Glassy carbon	9.0	NaOH	-0.40 to 1.00
HEPES	Platinum	6.0	NaOH	-0.40 to 0.90
HEPES	Platinum	7.0	NaOH	-0.40 to 0.90
HEPES	Platinum	8.0	NaOH	-0.40 to 1.10
HEPES	Platinum	9.0	NaOH	-0.40 to 1.00
Phosphate	Gold	6.0	H_2SO_4	0.25 to 1.60
Phosphate	Gold	7.0	H_2SO_4	0.25 to 1.50
Phosphate	Gold	8.0	H_2SO_4	0.25 to 1.50

Phosphate	Gold	9.0	H_2SO_4	0.25 to 1.50
Phosphate	Glassy carbon	6.0	H_2SO_4	0.40 to 1.10
Phosphate	Glassy carbon	7.0	H_2SO_4	0.20 to 1.10
Phosphate	Glassy carbon	8.0	H_2SO_4	0.25 to 1.00
Phosphate	Glassy carbon	9.0	H_2SO_4	0.40 to 1.00
Phosphate	Platinum	6.0	H_2SO_4	0.00 to 1.30
Phosphate	Platinum	7.0	H_2SO_4	0.00 to 1.20
Phosphate	Platinum	8.0	H_2SO_4	0.00 to 1.20
Phosphate	Platinum	9.0	H_2SO_4	0.00 to 1.20