

Insights into the Mechanism of Bipolar Electrodeposition of Au Films and Its Application in Visual Detection of Prostate Specific Antigens

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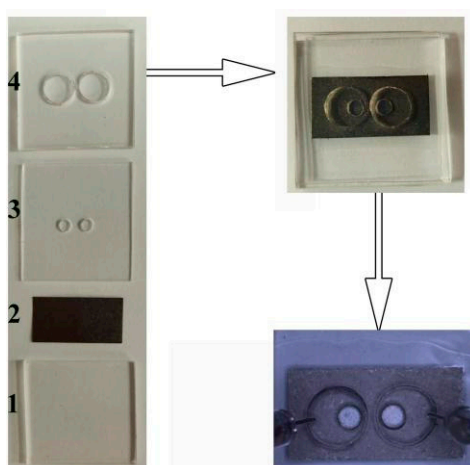
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- 2. Video S2.** Deposition of Au at the cathode of bare GP (cathode)—Au particles modified GP (anode). Both reservoirs were filled with H₂AuCl₄. A constant voltage of 4.5 V was applied on Pt wires for 5 min. 10 × frame rate.
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Scheme S1 Closed bipolar deposition device.

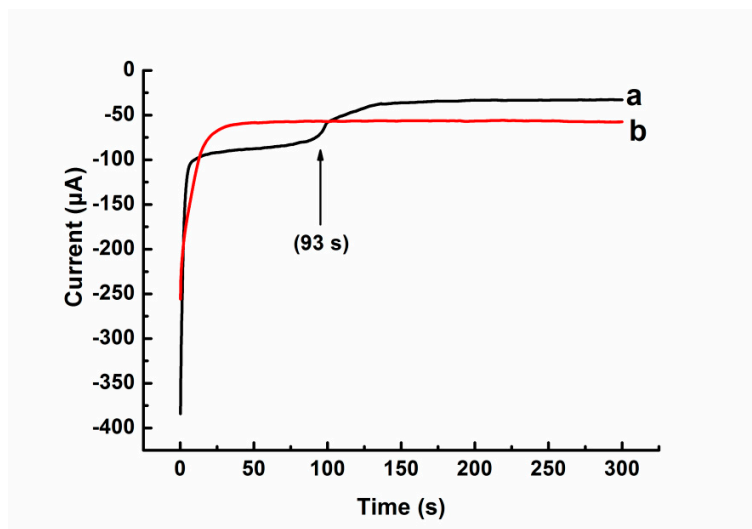


Figure S1 Amperometric i-t plots obtained on bare GP (cathode)-Au modified GP (anode) BPE when the anode was immersed into 10 mM PBS (a) and 5 mM HAuCl₄ (b), respectively. The cathode was immersed into 5 mM HAuCl₄. The external voltage was 4.5 V.

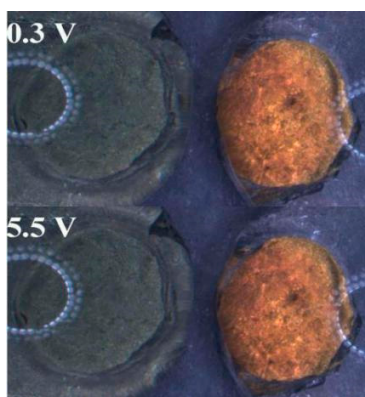


Figure S2 Optical images recorded during the second deposition of Au under linear sweep voltage. The left reservoir was filled with 5 mM HAuCl₄ and the right reservoir was filled with water. The voltage was applied from 0 to 5.5 V at a scan rate of 0.005 V/s.

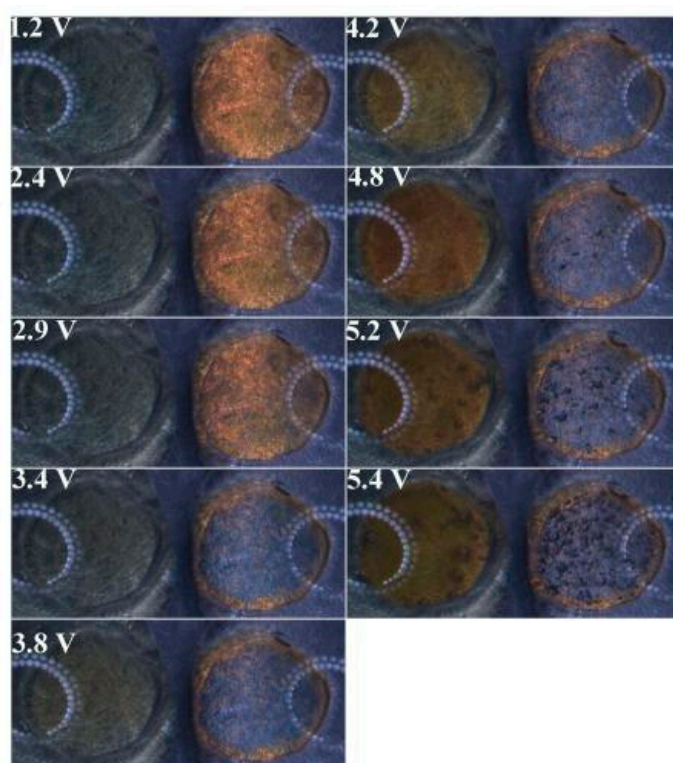


Figure S3 Optical images recorded during the second deposition of Au under linear sweep voltage. The left reservoir was filled with 5 mM HAuCl₄ and the right reservoir was filled with 10 mM PBS. The applied voltage was from 0 to 5.5 V at a scan rate of 0.005 V/s.

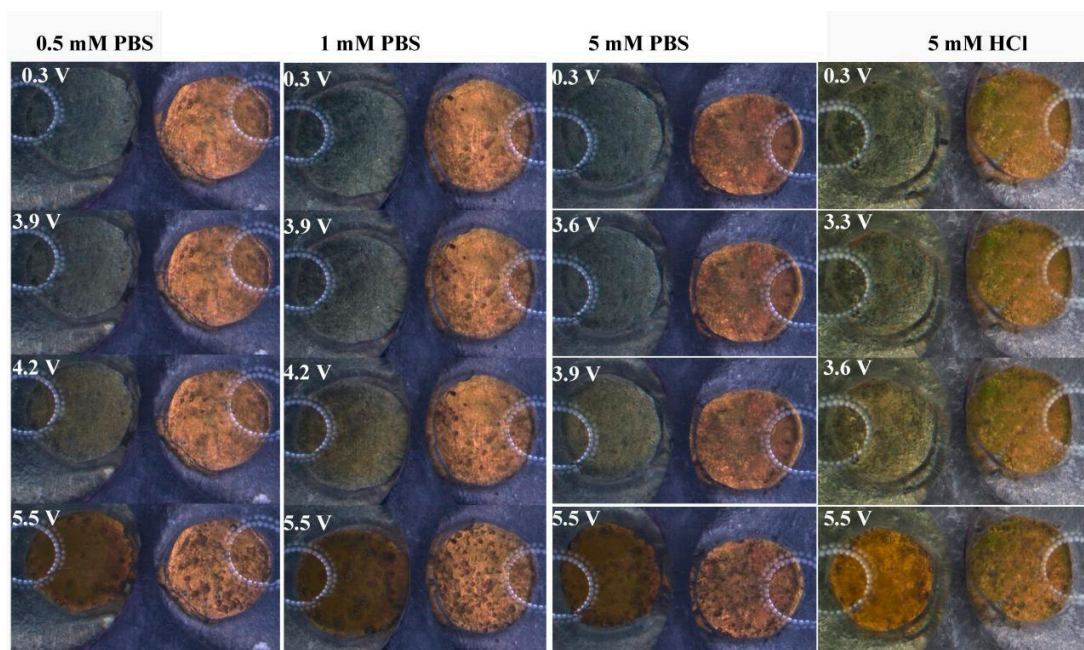


Figure S4 Optical images recorded during the second deposition of Au under linear sweep voltage. The left reservoir was filled with 5 mM HAuCl₄ and the right reservoir was filled with 0.5 mM PBS, 1 mM PBS, 5 mM PBS, and 5 mM HCl. The applied voltage was from 0 to 5.5 V at a scan rate of 0.005 V/s.

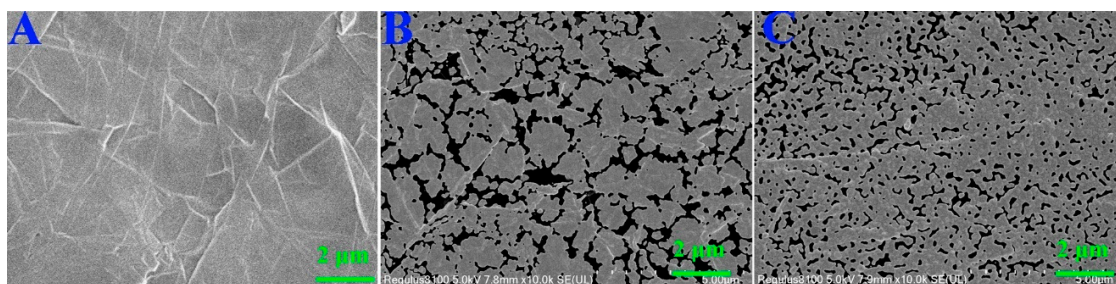


Figure S5 SEM images of (A) GP, (B) Au-1 film modified GP, and (C) Au-2 film modified GP.

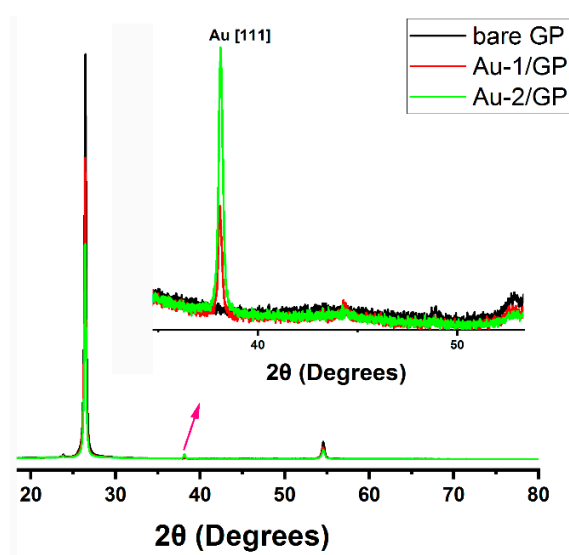


Figure S6 XRD patterns of GP substrate, Au-1 film modified GP (Au-1/GP), and Au-2 film modified GP (Au-2/GP).

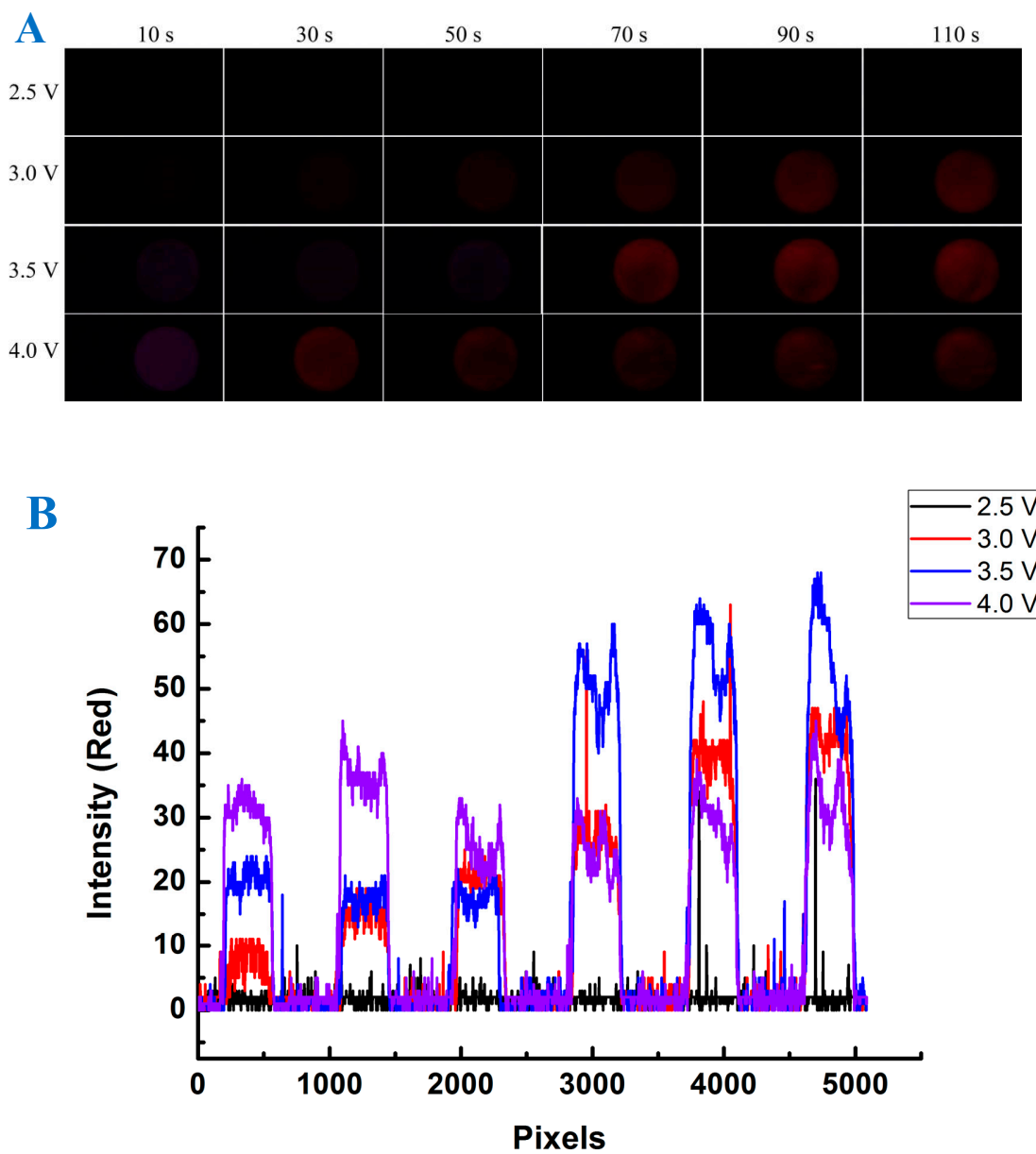


Figure S7 ECL images (A) and corresponding red channel intensity (B) obtained on Au modified (cathode)-Au modified (anode) GP BPE under different external voltages.

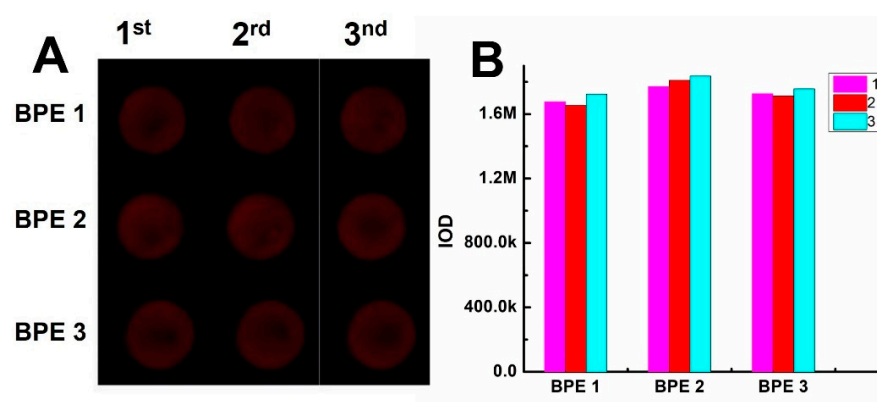


Figure S8 ECL images (A) and corresponding IOD (integrated optical intensity, B) obtained on four Au modified (cathode)-Au modified (anode) GP BPEs for three consecutive measurements.

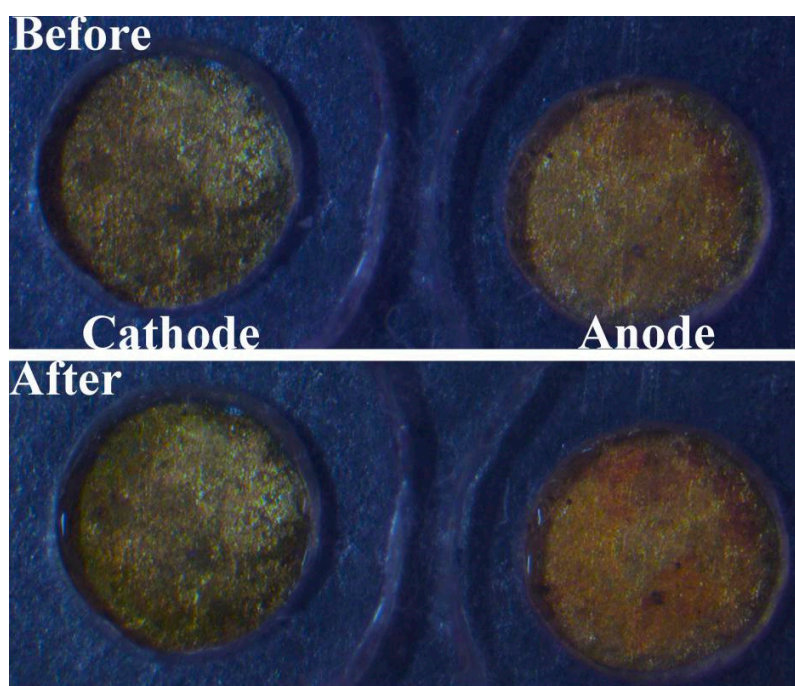


Figure S9 Images of BPE before and after three consecutive ECL detections.

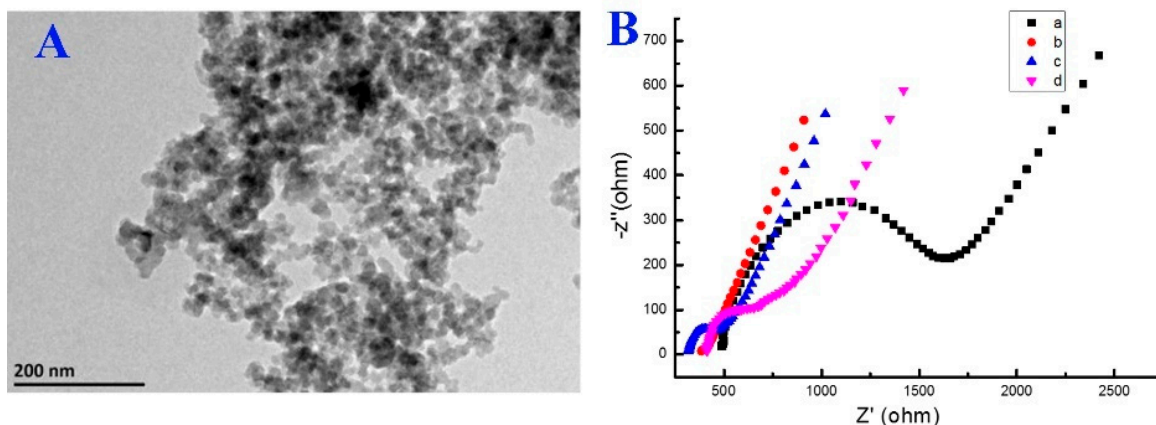


Figure S10 (A) TEM image of SiO₂ NPs. (B) Electrochemical impedance spectrum of various electrodes. Electrode was immersed in 5.0 mM [Fe(CN)₆]^{3-/4-} solution containing 0.1 M KCl. Frequency range: 0.1-10⁵ Hz. (a) Bare GP, (b) Ab₁/Au/GP, (c) PSA/Ab₁/Au/GP, (d) Ab₂-SiO₂/PSA/Ab₁/Au/GP.

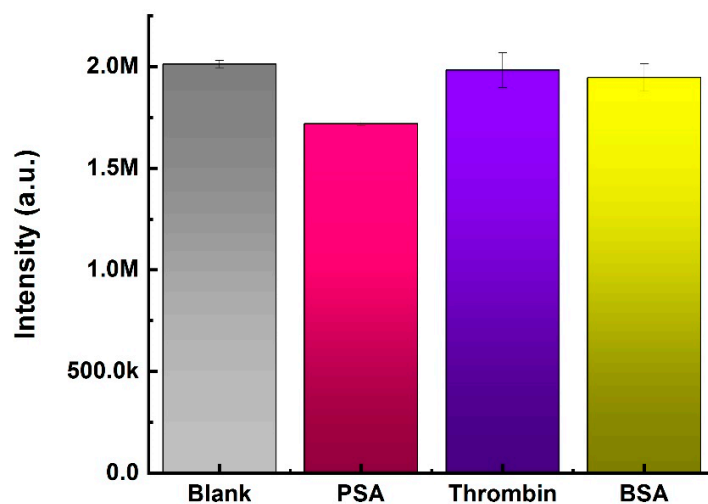


Figure S11 Selectivity of the designed biosensor towards thrombin and BSA. The concentration of PSA was 1 ng/mL. The concentration of thrombin and BSA were 10 ng/mL.

Table S1 Conductivity of solutions

Solution	Conductivity ($\mu\text{S/cm}$)
10 mM PBS	Out of range
5 mM PBS	8280
5 mM HAuCl_4	2340
5 mM HCl	2000
1 mM PBS	1779
0.5 mM PBS	923
H_2O	1.70

Table S2 Performance of the proposed biosensor compared with other biosensors

Analytical method	Linear range (ng/mL)	LOD (ng/mL)	Refs
ECL	1.0 to 1000	0.5	[1]
ECL	0.5 to 50	0.031	[2]
Colorimetric assay	0.1 to 100	0.02	[3]
Electrochromic assay	0.1 to 50	0.03	[4]
Photothermal imaging assay	1 to 200	0.2	[5]
ECL	0.1 to 1000	0.071	Our work

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