

Supplementary Information

A cost-effective disposable graphene-modified electrode decorated with alternating layers of Au NPs for the simultaneous detection of dopamine and uric acid in human urine

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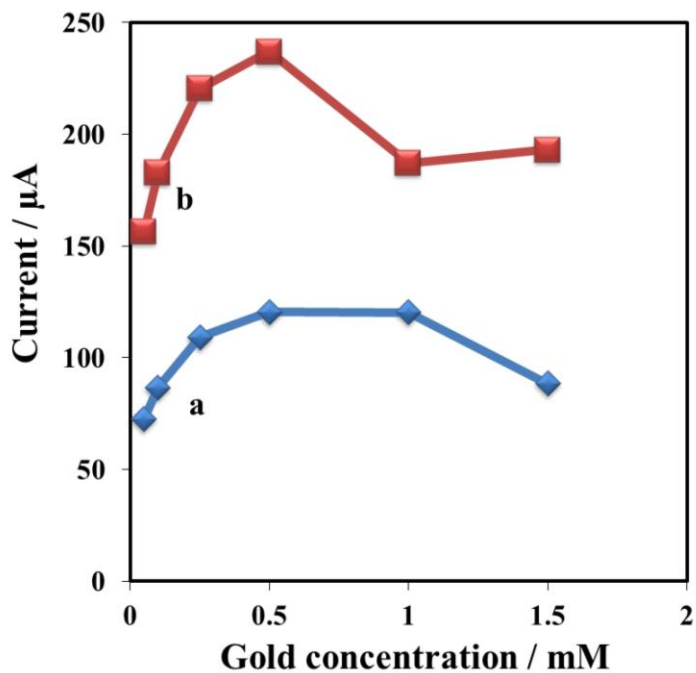


Fig. S1. The CVs oxidation peak current response for 0.5 mM dopamine (a) and uric acid (b) in 0.1 mM PBS at various concentration of HAuCl_4 .

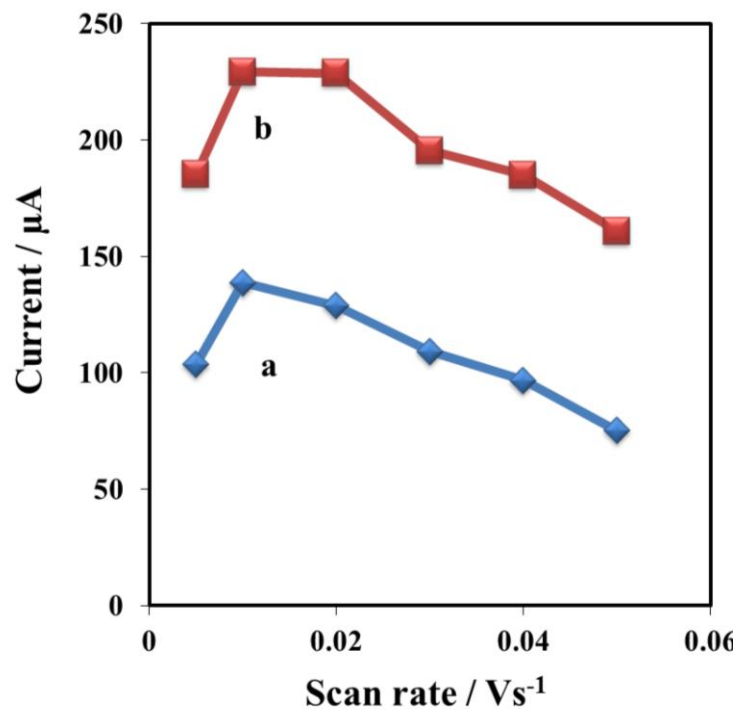


Fig. S2. The CVs oxidation peak current response for 0.5mM dopamine (a) and uric acid (b) in 0.1 mM PBS at various scan rate for the reduction of Au⁺³ on the electrode surface for Au NPs formation.

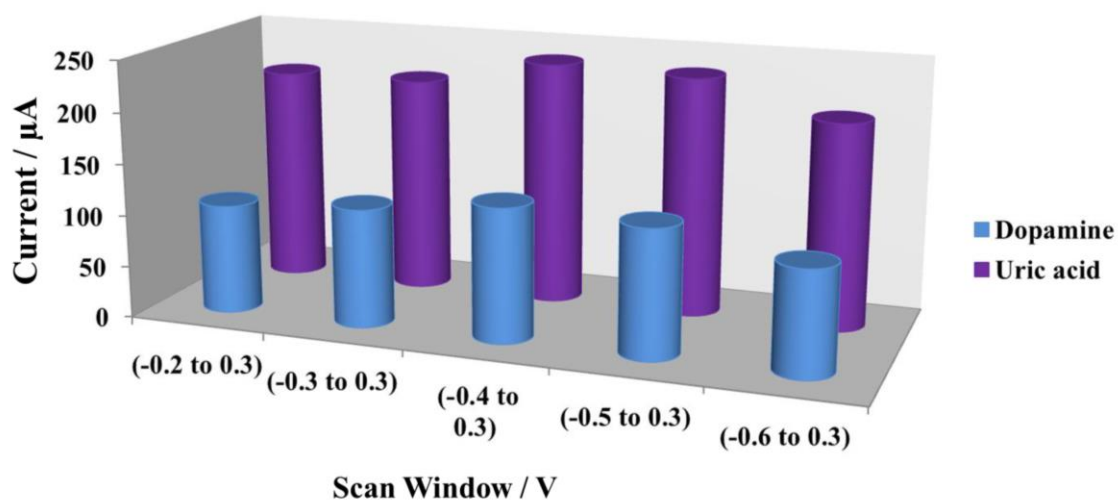


Fig. S3. The Scan window optimization for reduction of Au⁺³ for 0.5mM dopamine and uric acid in 0.1 mM PBS.

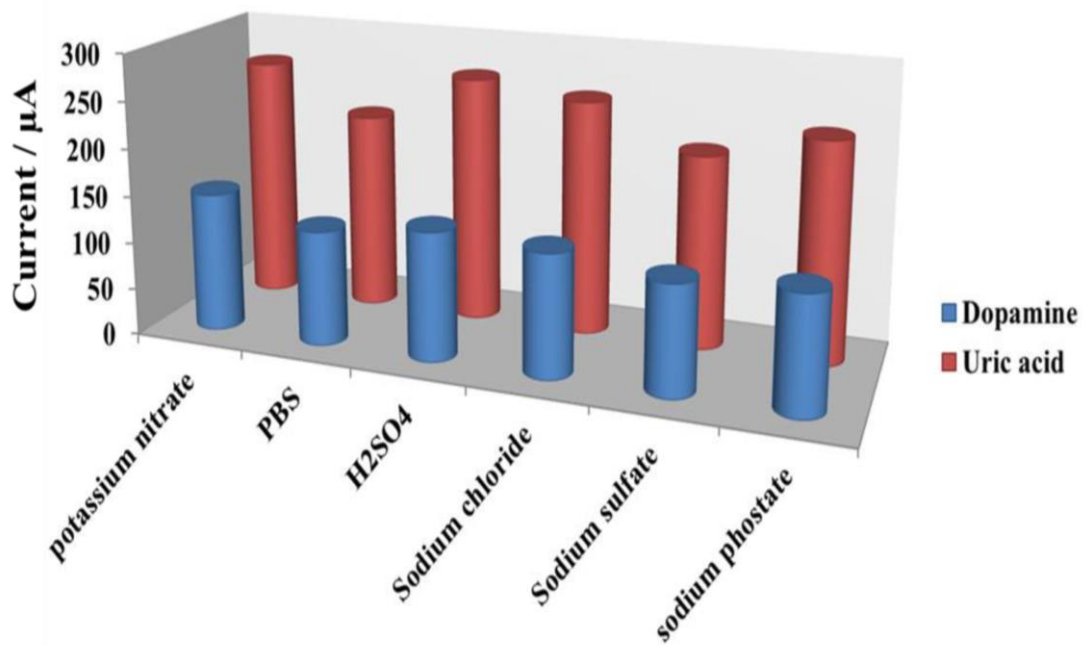


Fig. S4. The different electrolyte behavior for Au^{+3} reduction on GPE surface for 0.5 mM dopamine and uric acid in 0.1 mM PBS.

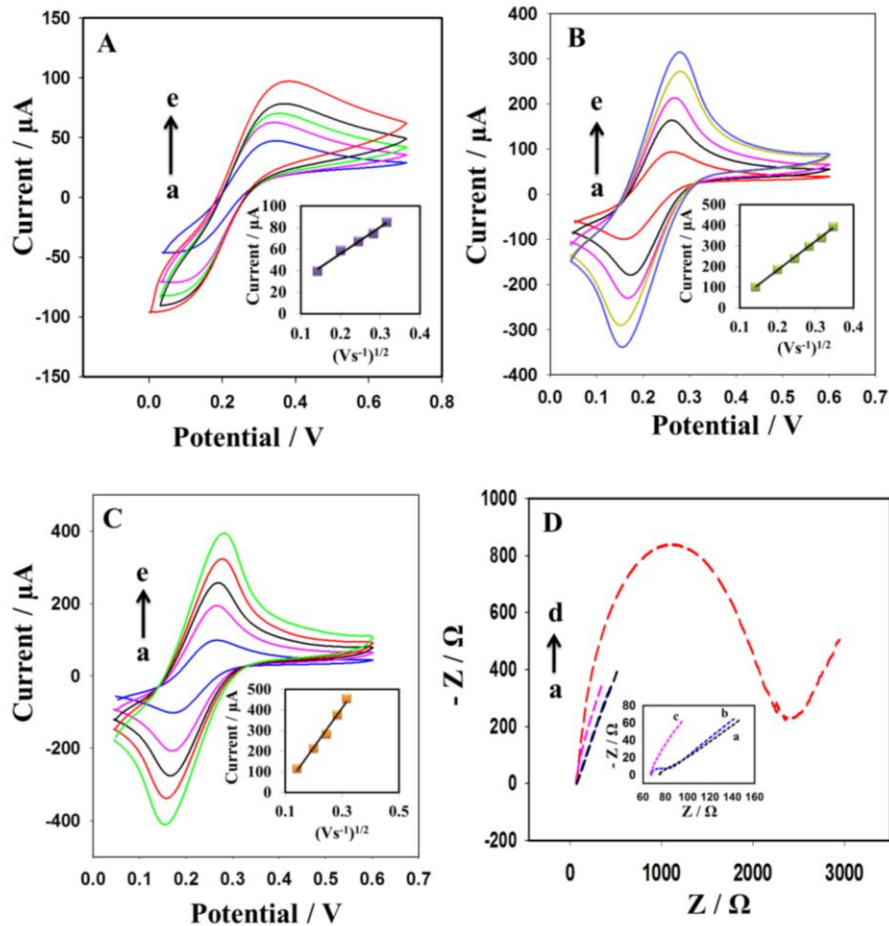


Fig. S5. Cyclic voltammograms obtained from a solution comprising 5 mM $\text{K}_3\text{Fe}(\text{CN})_6/\text{K}_4\text{Fe}(\text{CN})_6$ and 0.1 M KCl, using (A) the bare GPE, (B) GR/GPE, and (C) GR/Au/GR/Au/GPE at scan rates of (a) 20 mVs^{-1} , (b) 40 mVs^{-1} , (c) 60 mVs^{-1} , (d) 80 mVs^{-1} , or (e) 100 mVs^{-1} . The insets in (A), (B), and (C) reveal the linear relationship between the current and the square root of the scan rates. (D) EIS of the (a) GR/GPE, (b) Au/GPE, (c) GR/Au/GR/Au/GPE, and (d) bare GPE under an applied 5 mV potential over the frequency range 100 kHz to 0.01 Hz in a KCl (0.1 M) solution comprising 5 mM $\text{K}_3\text{Fe}(\text{CN})_6/\text{K}_4\text{Fe}(\text{CN})_6$.

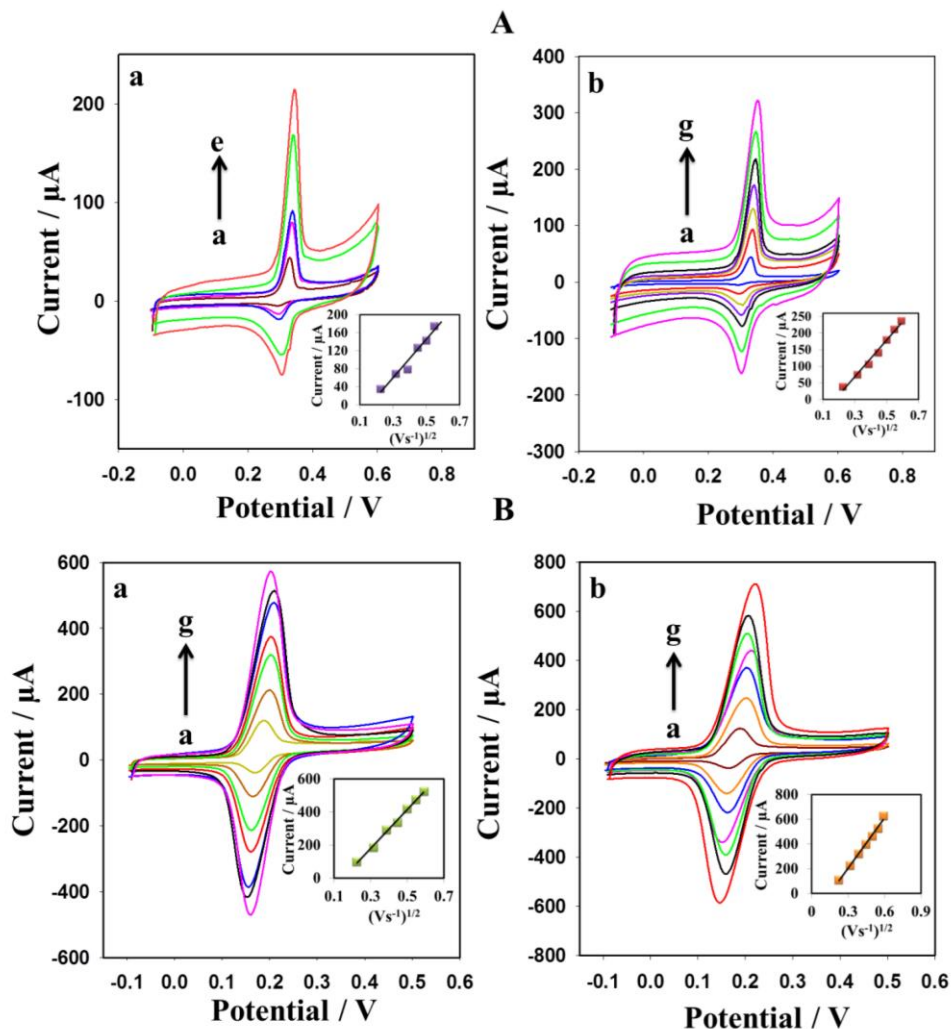


Fig. S6. Cyclic voltammograms were obtained from a solution comprising 0.2 mM uric acid (A) and 1 mM dopamine (B) in 0.1 M PBS. The responses of the GR/GPE to uric acid (Aa) at scan rates of 50 mVs^{-1} (a), 100 mVs^{-1} (b), 150 mVs^{-1} (c), 250 mVs^{-1} (d), and 300 mVs^{-1} (e). The responses of the GR/Au/GR/Au/GPE to uric acid (Ab) at scan rates of 50 mVs^{-1} (a), 100 mVs^{-1} (b), 150 mVs^{-1} (c), 200 mVs^{-1} (d), 250 mVs^{-1} (e), 300 mVs^{-1} (f), and 350 mVs^{-1} (g). The responses of the GR/GPE (Ba) and GR/Au/GR/Au/GPE (Bb) at scan rates of 50 mVs^{-1} (a), 100 mVs^{-1} (b), 150 mVs^{-1} (c), 200 mVs^{-1} (d), 250 mVs^{-1} (e), 300 mVs^{-1} (f), and 350 mVs^{-1} (g). The insets in (A) and (B) reveal the linear relationship between the current and the square root of the scan rate.

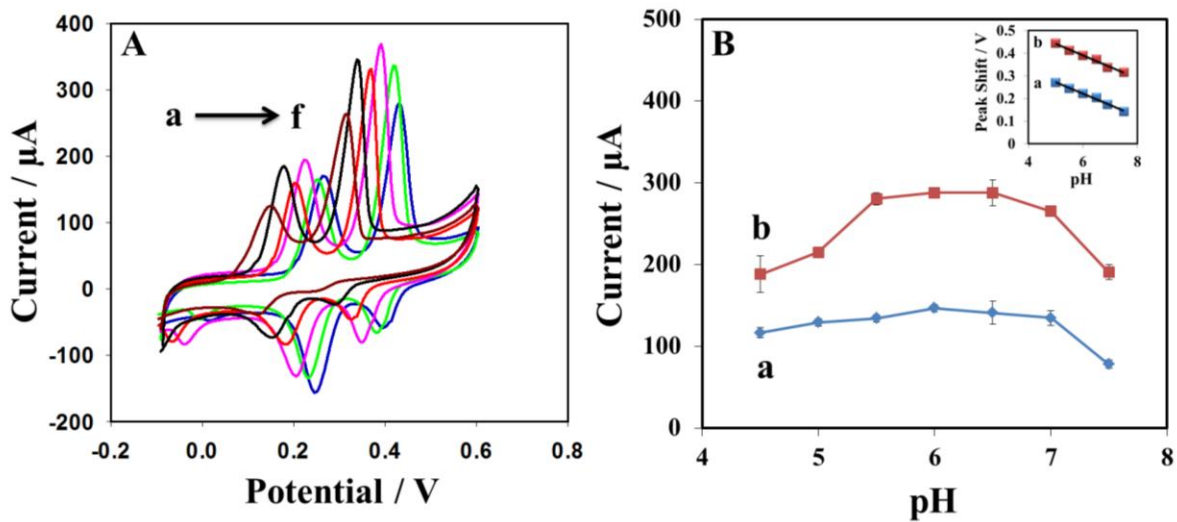


Fig. S7. (A) Cyclic voltammograms obtained from solutions comprising of 0.5 mM dopamine and uric acid in 0.1 M PBS at various pH values: (a) 7.5 pH, (b) 7.0 pH, (c) 6.5 pH, (d) 6.0 pH, (e) 5.5 pH, (f) 5.0 pH at GR/Au/GR/Au/GPE. (B) Graphical representation of the peak current vs. pH for uric acid (a) and dopamine (b). Inset: Relationship between the pH and the oxidation peak potential.

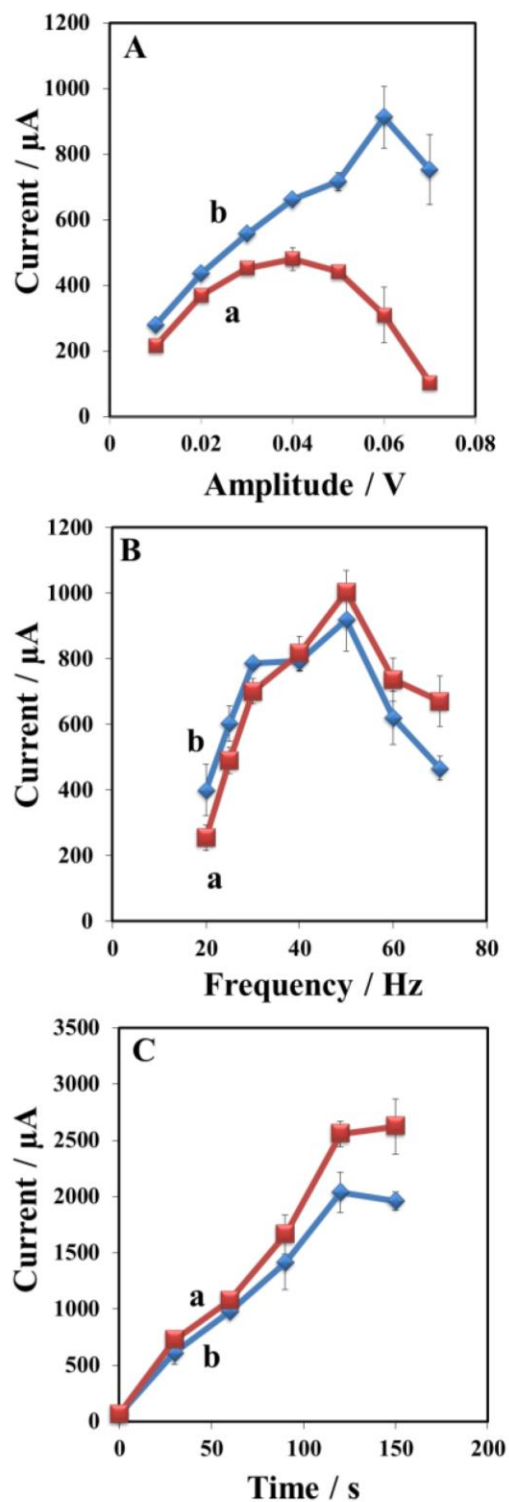


Fig.S8. Plots of the oxidation peak current vs. the (A) amplitude or (B) frequency, (C) collected at 20 μ M after a 10 s adsorption time in the presence of 10 μ M (a) uric acid or (b) dopamine, obtained from the SWV in a PBS buffer (0.1 M, 6.0 pH).

Table S1

The effect of various potential interferences on the signal of 10 μ M dopamine and uric acid.

Interferences	Concentrations	Uric acid %error	Dopamine % error
Ascorbic acid	1mM	+9.3	+7.0
alanine	0.1mM	+10	+4.4
Phenyl alanine	0.1mM	-1.8	-14
Fructose	0.1mM	-1.2	-5.2
I-methionine	0.1mM	+0.96	+0.9