Electrochemical Hg^{2+} detection at tannic acid-gold nanoparticle modified electrodes by square wave voltammetry

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SUPPORTING INFORMATION

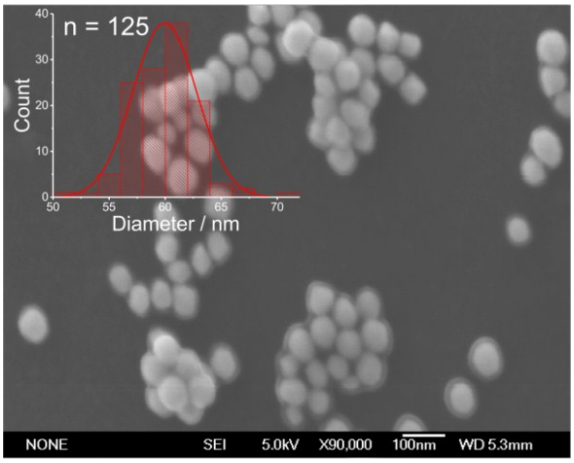

Figure S1. SEM micrograph of AuNP@TA. Inset showing the size distribution of AuNP@TA.

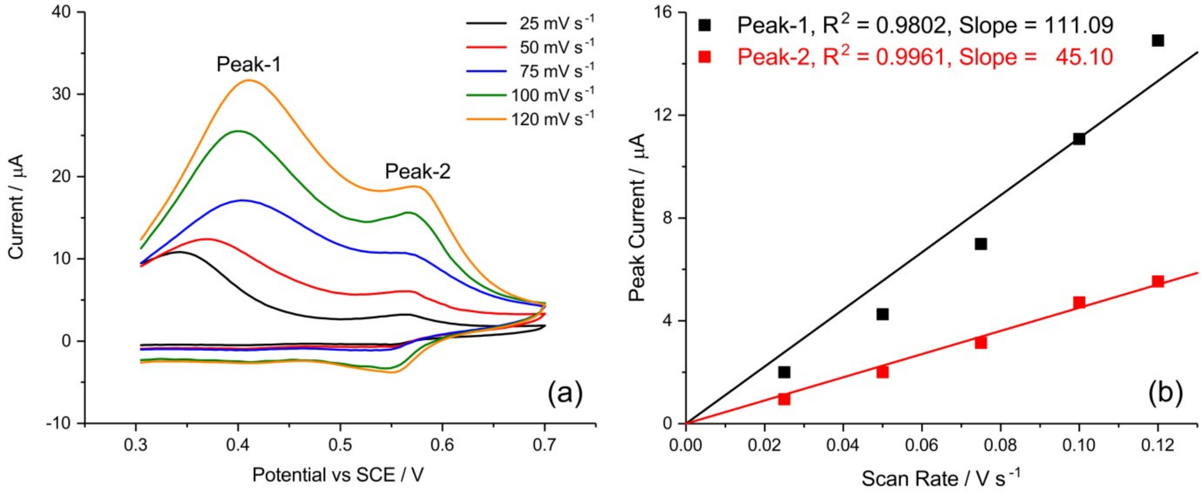

Figure S2. Scan rate dependence of Hg^{2+} detection at AuNP@TA-GCE. (a) Voltammograms of AuNP@TA-GCE at various scan rates. (b) Linear peak current behaviour at scan rates shown in (a).

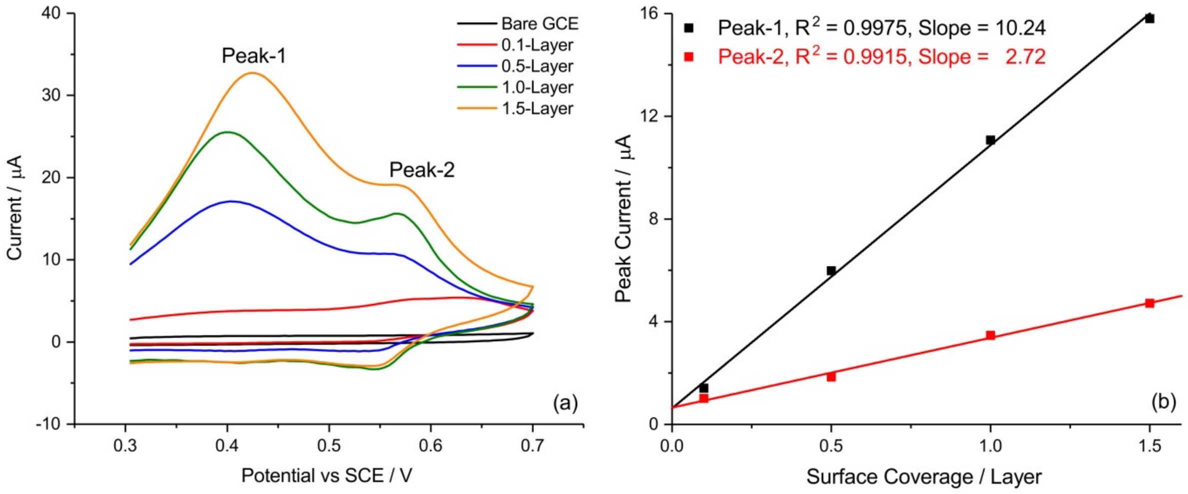

Figure S3. AuNP@TA surface concentration assessment of Hg^{2+} detection at AuNP@TA-GCE. (a) Voltammograms of AuNP@TA-GCE at various coverages. (b) Linear peak current behaviour at AuNP@TA surface concentrations shown in (a).

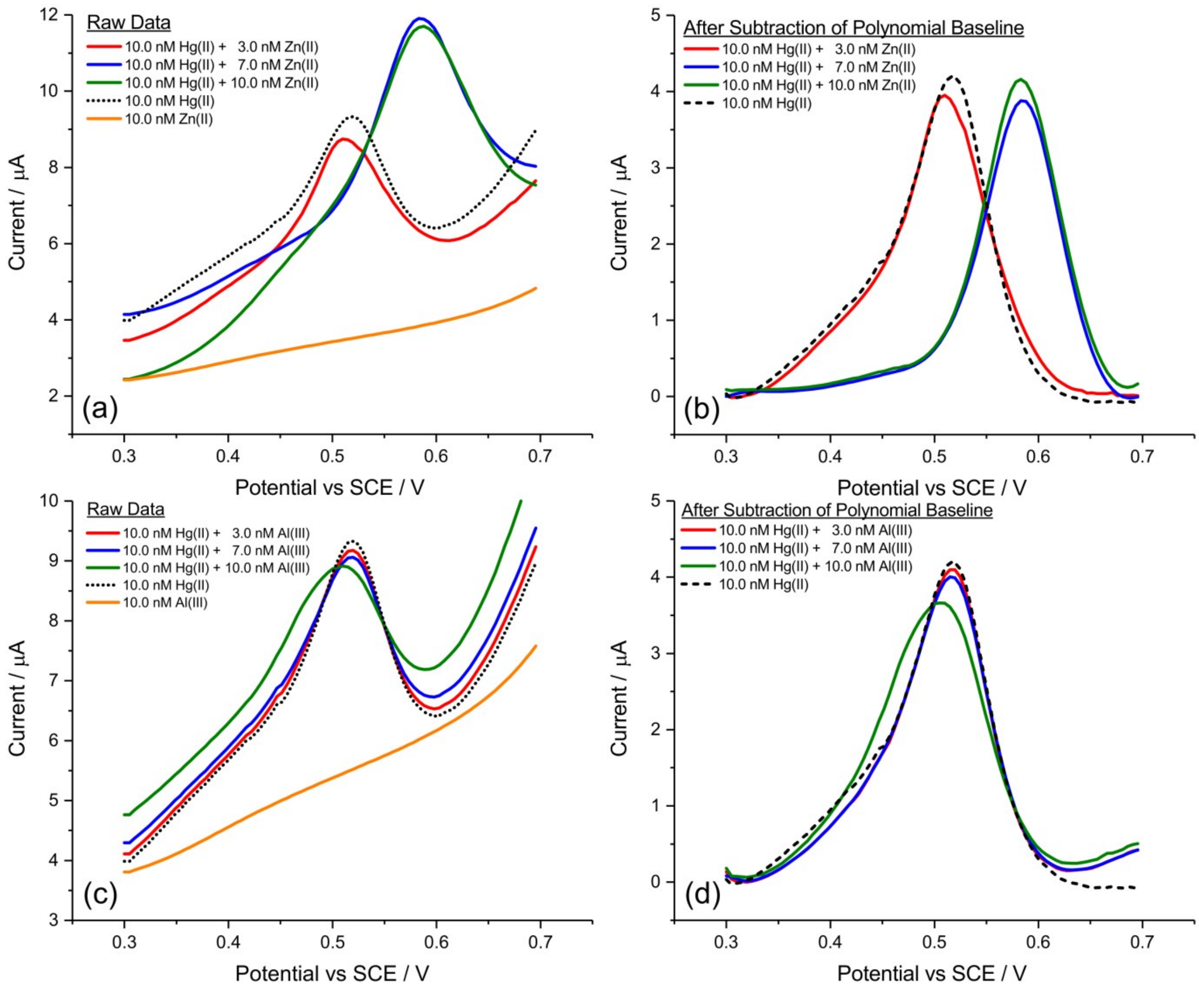

Figure S4. Selectivity Performance of the AuNP@TA-GCE system during SWV. (a) and (c) showing raw data acquired using the AuNP@TA-GCE at mixture solution with three different concentrations of Zn^{2+} and Al^{3+}, respectively. (b) and (d) showing subtraction of polynomial baseline.

Table S1. Peak Current and Peak Charge in the Presence of Other Ions Evaluated by SWV

Analyte Composition	Peak Potential (vs SCE)	Peak Current (μA)	Peak Charge (μC)
10.0 nM Hg(II)	0.51 V	*ca.* 4.2	0.49
10.0 nM Hg(II) + 3.0 nM Zn(II)	0.51 V	*ca.* 4.0	0.47
10.0 nM Hg(II) + 7.0 nM Zn(II)	0.58 V	*ca.* 4.0	0.43
10.0 nM Hg(II) + 10.0 nM Zn(II)	0.58 V	*ca.* 4.1	0.45
10.0 nM Hg(II)	0.51 V	*ca.* 4.2	0.49
10.0 nM Hg(II) + 3.0 nM Al(III)	0.51 V	*ca.* 4.1	0.48
10.0 nM Hg(II) + 7.0 nM Al(III)	0.51 V	*ca.* 4.0	0.47
10.0 nM Hg(II) + 10.0 nM Al(III)	0.51 V	*ca.* 3.8	0.48

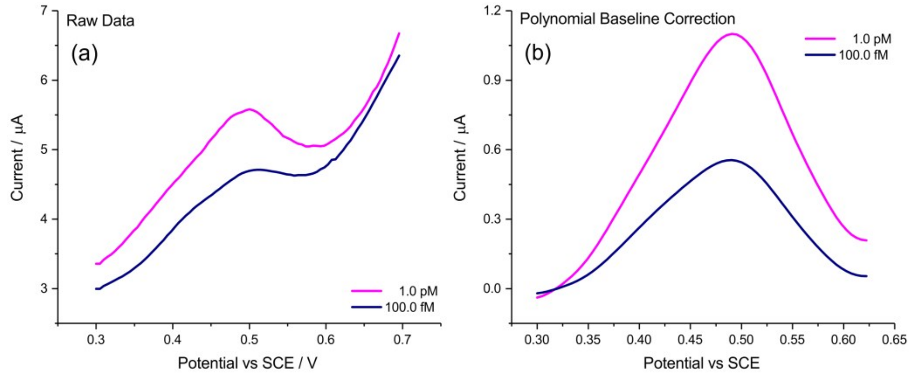

Figure S5. (a) Raw data acquired using the AuNP@TA-GCE system at two concentrations of Hg^{2+}. (b) Data in (a) after subtraction of polynomial baseline (typically order 3) from raw data.

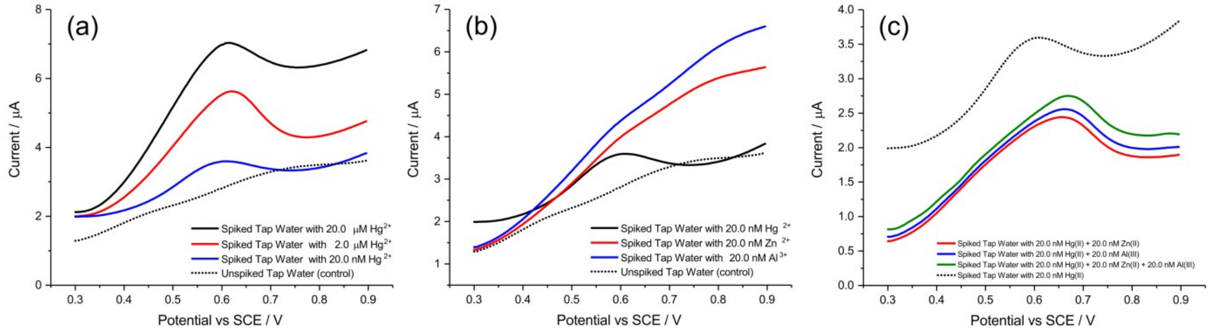

Figure S6. Detection of Hg^{2+} in spiked tap water using SWV. (a) In spiked tap water with varying Hg^{2+} concentrations. (b) In spiked tap water in the presence of different metal ions. (d) In spiked tap water in the presence of binary and ternary mixtures of different metal ions.

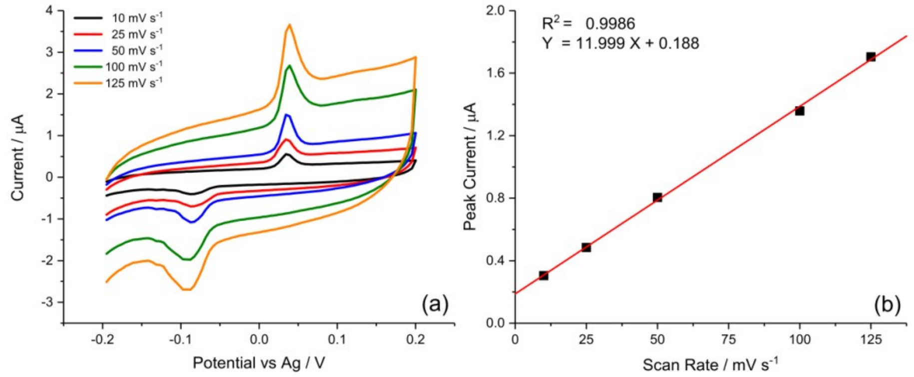

Figure S7. Characterisation of AuNP@TA-SPE in HCl-KCl (pH1.0). (a) Voltammograms recorded at AuNP@TA-SPEs at various scan rates. (b) Linear peak current behaviour at various scan rates.

Relative Error Calculations

Standard error of linear regression for [Hg^{2+}] = y

Error progression calculation:

$$\Delta[Hg] = \frac{\partial\left(10^{y}\right)}{\partial y} * \ \Delta y$$

$$\Delta[Hg] = ln10 * 10^{y} * \Delta y$$

$$\Delta[Hg] = 2.303 * [Al] * \Delta y$$

$$\frac{\Delta[Hg]}{[Hg]} = 2.303 * \Delta y$$

$$\frac{\Delta[Hg]}{[Hg]} = 0.263$$