

ELECTRONIC SUPPLEMENTARY INFORMATION

Electroanalytical application of a boron-doped diamond electrode in sensitive voltammetric determination of theophylline in pharmaceutical dosages and human urine

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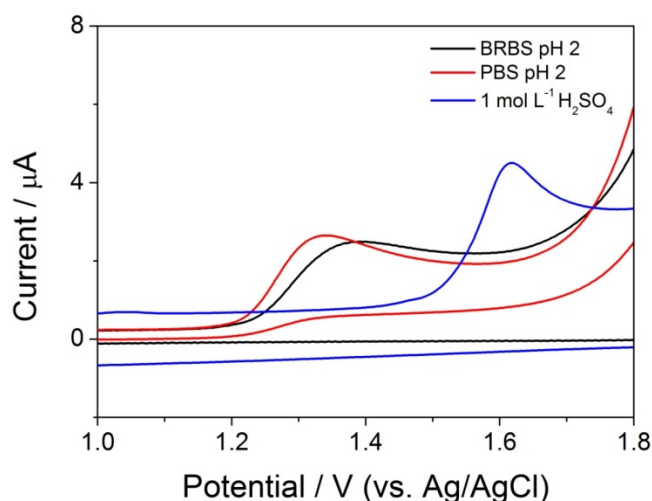


Fig. S1: Cyclic voltammograms of 2 mmol L⁻¹ TP at various supporting electrolytes on the BDD electrode with scan rate of 100 mV s⁻¹.

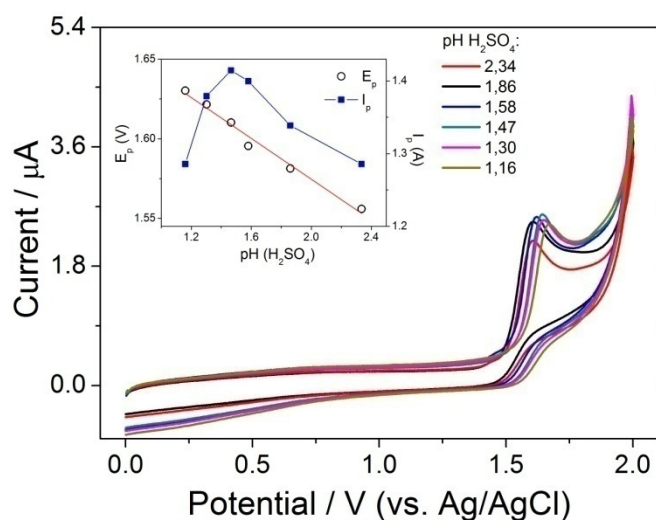


Fig. S2: Cyclic voltammograms of 1 mmol L⁻¹ TP at various pHs of H₂SO₄ on the BDD electrode with scan rate of 100 mV s⁻¹. The effect of pH on the peak potential (E_p) and peak current (I_p) of TP appears in the inset of figure.

Optimization of DPV and SWV parameters

The optimization was carried out using 1 mmol L^{-1} TP in the presence of 1 mol L^{-1} sulphuric acid on the BDD electrode (Fig. S3 and S4). In the case of DPV, variation of modulation amplitude in the range of 10-150 mV (with fixed modulation time at 25 ms) showed that the peak current increased. This was associated with slight shift towards more negative potentials. As for the modulation time (with fixed modulation amplitude at 50 mV) the current response decreased with an increasing modulation time in the range from 10-150 ms. At the same time, background current declined. The best results were obtained by choosing appropriate modulation amplitude of 50 mV, modulation time of 25 ms and scan rate of 10 mV s^{-1} . Concerning the SWV, by variation of amplitude (with fixed frequency at 25 Hz) from 10 to 150 mV the background current got significantly higher. This effect was accompanied by broadening of the peak and slight shift towards more negative potentials. In the case of frequency (with fixed amplitude at 25 mV), the current response increased and shifted to more positive potentials in the range from 10-150 Hz. Overall, amplitude of 25 mV, frequency of 50 Hz and scan rate of 250 mV s^{-1} represent the most suitable SWV parameter values for the determination of TP on BDD electrode. Subsequently, these parameters were used for the calibration curves construction.

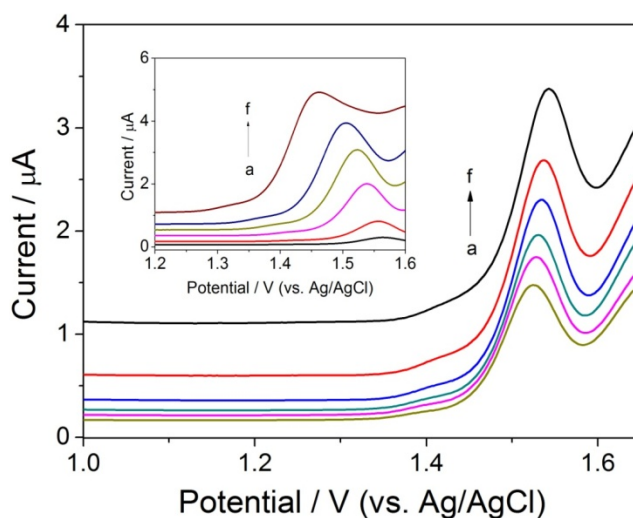


Fig. S3: DP voltammograms of 1 mmol L^{-1} TP for various modulation times: (a) 10, (b) 25, (c) 50, (d) 75, (e) 100 and (f) 150 ms at amplitude of 50 mV in 1 mol L^{-1} H₂SO₄ on BDD electrode. Various modulation amplitudes: (a) 10, (b) 25, (c) 50, (d) 75, (e) 100 and (f) 150 mV at modulation time of 25 ms appear in the inset.

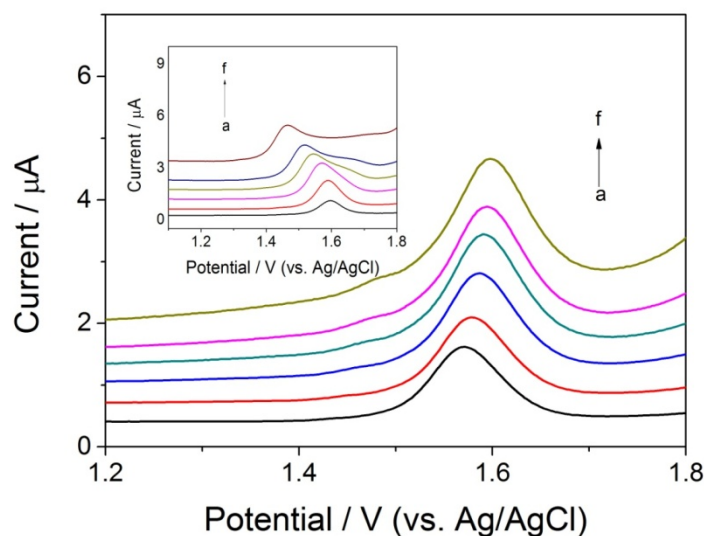


Fig. S4: SW voltammograms of 1 mmol L^{-1} TP for various frequencies: (a) 10, (b) 25, (c) 50, (d) 75, (e) 100 and (f) 150 Hz at amplitude of 25 mV in 1 mol L^{-1} H₂SO₄ on BDD electrode. Various amplitudes: (a) 10, (b) 25, (c) 50, (d) 75, (e) 100 and (f) 150 mV at frequency of 25 Hz appear in the inset.

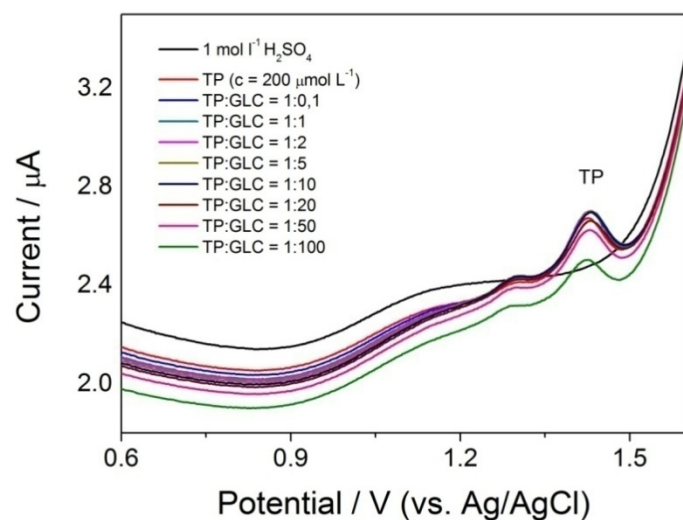


Fig. S5: DP voltammograms demonstrating the effect of the presence of glucose (GLC) on current response of $200 \mu\text{mol L}^{-1}$ TP in $1 \text{ mol L}^{-1} \text{H}_2\text{SO}_4$ on BDD electrode. The concentration ratios between TP and GLC are stated in the legend of figure. DPV parameters: modulation amplitude of 50 mV , modulation time of 25 ms and scan rate of 10 mV s^{-1} .

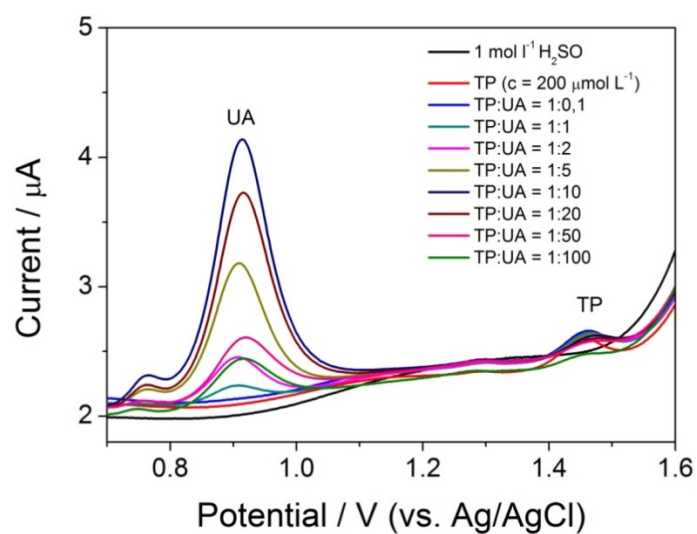


Fig. S6: DP voltammograms demonstrating the effect of the presence of uric acid (UA) on current response of $200 \mu\text{mol L}^{-1}$ TP in $1 \text{ mol L}^{-1} \text{H}_2\text{SO}_4$ on BDD electrode. The concentration ratios between TP and UA are stated in the legend of figure. DPV parameters: modulation amplitude of 50 mV , modulation time of 25 ms and scan rate of 10 mV s^{-1} .

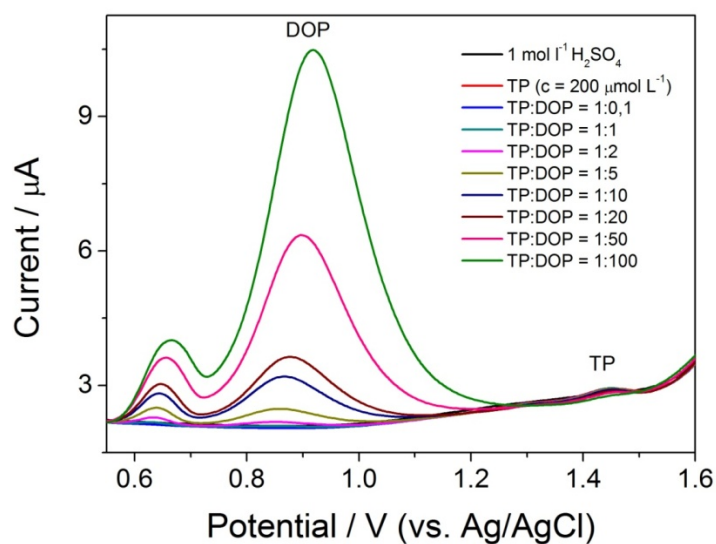


Fig. S7: DP voltammograms demonstrating the effect of the presence of dopamine (DOP) on current response of $200 \mu\text{mol L}^{-1}$ TP in $1 \text{ mol L}^{-1} \text{H}_2\text{SO}_4$ on BDD electrode. The concentration ratios between TP and DOP are stated in the legend of figure. DPV parameters: modulation amplitude of 50 mV, modulation time of 25 ms and scan rate of 10 mV s^{-1} .

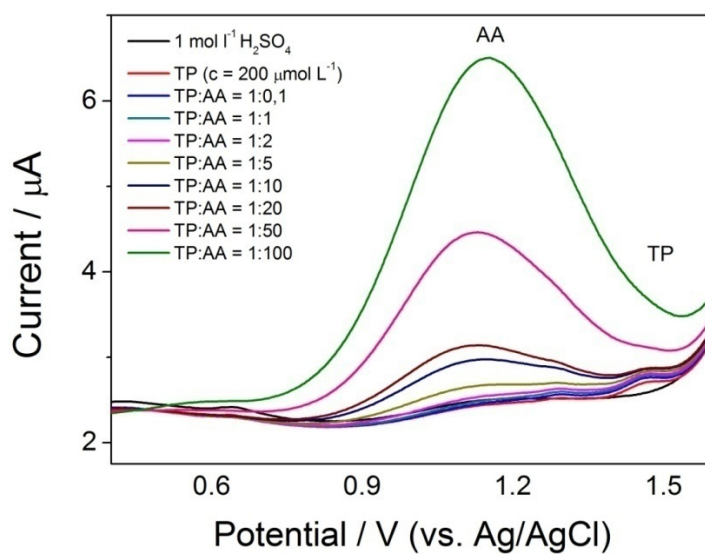


Fig. S8: DP voltammograms demonstrating the effect of the presence of ascorbic acid (AA) on current response of $200 \mu\text{mol L}^{-1}$ TP in $1 \text{ mol L}^{-1} \text{H}_2\text{SO}_4$ on BDD electrode. The concentration ratios between TP and AA are stated in the legend of figure. DPV parameters: modulation amplitude of 50 mV, modulation time of 25 ms and scan rate of 10 mV s^{-1} .

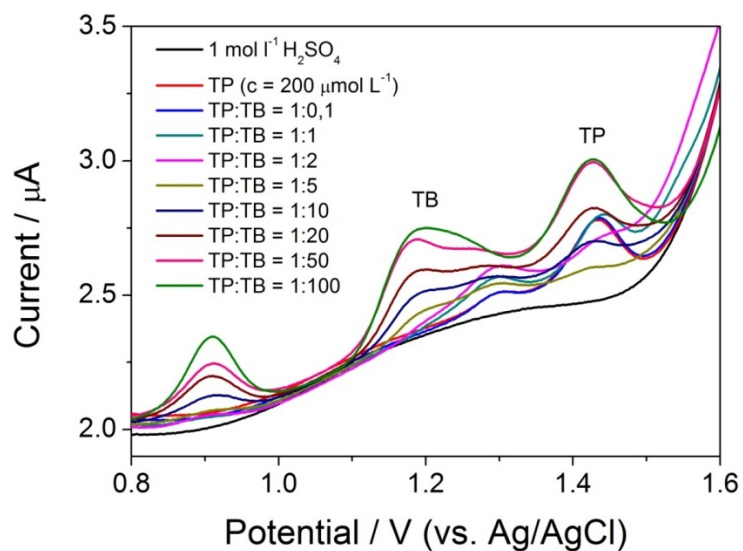


Fig. S9: DP voltammograms demonstrating the effect of the presence of theobromine (TB) on current response of $200 \mu\text{mol L}^{-1}$ TP in $1 \text{ mol L}^{-1} \text{H}_2\text{SO}_4$ on BDD electrode. The concentration ratios between TP and TB are stated in the legend of figure. DPV parameters: modulation amplitude of 50 mV , modulation time of 25 ms and scan rate of 10 mV s^{-1} .

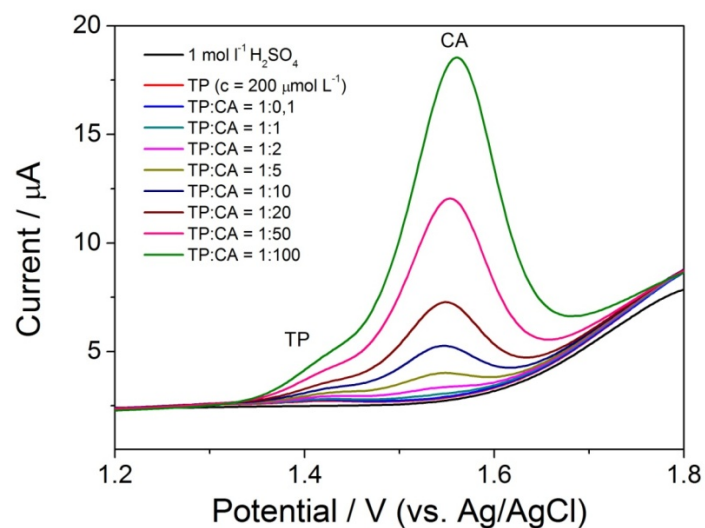


Fig. S10: DP voltammograms demonstrating the effect of the presence of caffeine (CA) on current response of $200 \mu\text{mol L}^{-1}$ TP in $1 \text{ mol L}^{-1} \text{H}_2\text{SO}_4$ on BDD electrode. The concentration ratios between TP and CA are stated in the legend of figure. DPV parameters: modulation amplitude of 50 mV , modulation time of 25 ms and scan rate of 10 mV s^{-1} .