Electronic Supplementary Material (ESI) for Lab on a Chip.
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Threads in tubing: an innovative approach towards improved electrochemical thread-based microfluidic devices

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Supporting Information

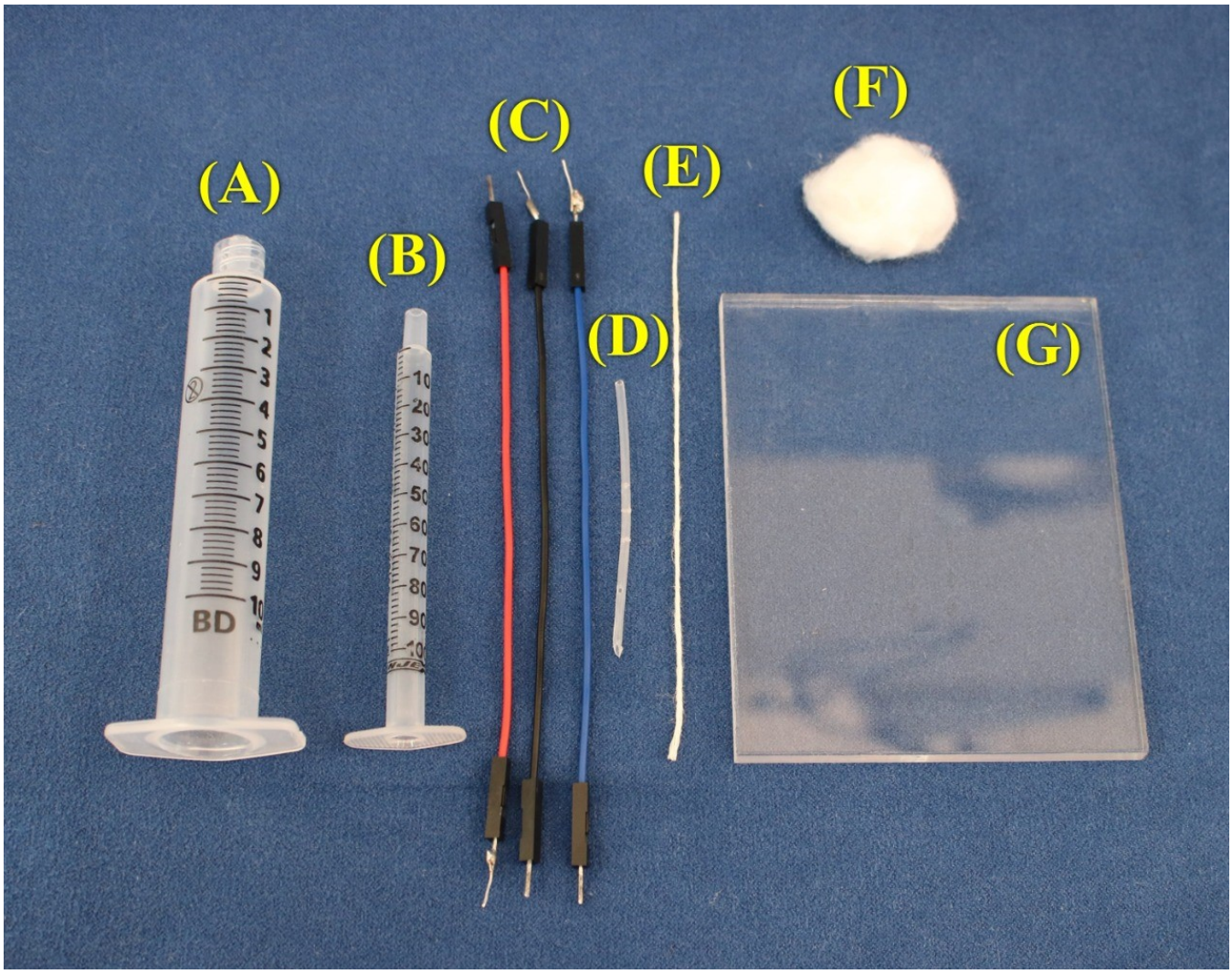

Figure S1: Materials used to fabricate the electrochemical thread-based microfluidic device. A) 3 mL disposable syringe used as the outlet reservoir. B) 1 mL disposable syringe used as the inlet reservoir. C) 0.5 mm Pt wires connected to metallic wires used as the electric contacts to the potentiostat. D) 0.8 mm inner diameter polyethylene tube with 50 mm length. E) Cotton thread from the cotton string. F) Cotton piece used as the wicking agent in the outlet reservoir. G) Polymethylmethacrylate plate used as the support for the microfluidic device.

Video S1: Electrochemical thread-based microfluidic device assembly.

Video S2: Injection of 5 µL of a green dye solution in the electrochemical thread-based microfluidic device.

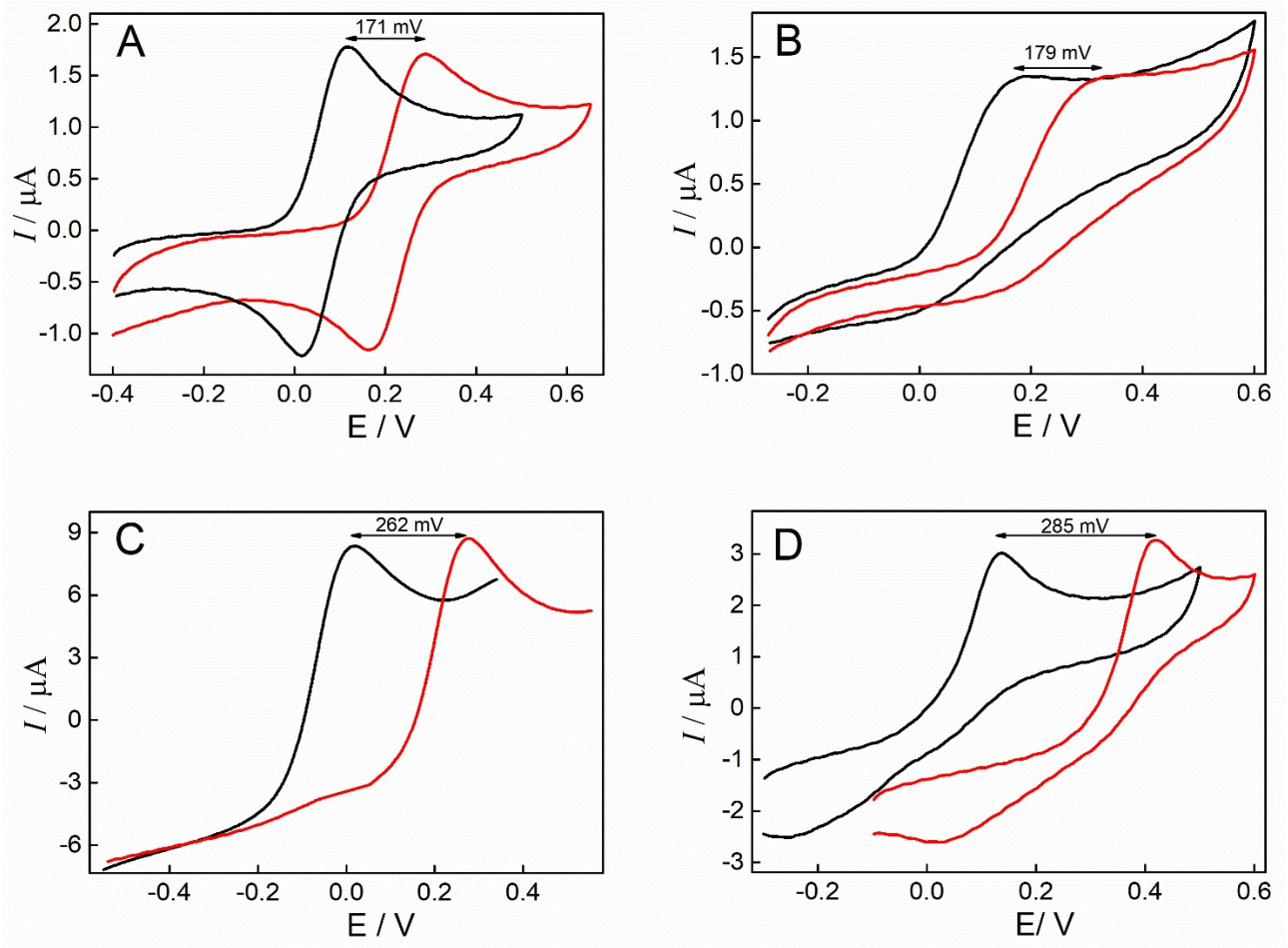

Figure S2: Voltametric comparison of the peak potentials observed versus Pt pseudo reference (black curves) and $Ag/AgCl/KCl_{saturated}$ reference electrode (red curves) for 1.0 mmol L^{-1} of some selected redox species. A) Cyclic voltammograms recorded in the presence of ferrocyanide ion in 0.1 mol L^{-1} KCl at 50 mV s^{-1}. B) Cyclic voltammograms recorded in the presence of dopamine in 0.1 mol L^{-1} phosphate buffer solution (pH = 7.0) at 50 mV s^{-1}. C) Square wave voltammograms recorded in the presence of hydrogen peroxide in 0.1 mol L^{-1} phosphate buffer solution (pH = 7.0) with pulse amplitude = 50 mV, frequency = 25 Hz, and step potential = 5 mV. D) Cyclic voltammograms recorded in the presence of TBHQ in 0.1 mol L^{-1} $HClO_4$ solution at 50 mV s^{-1}.

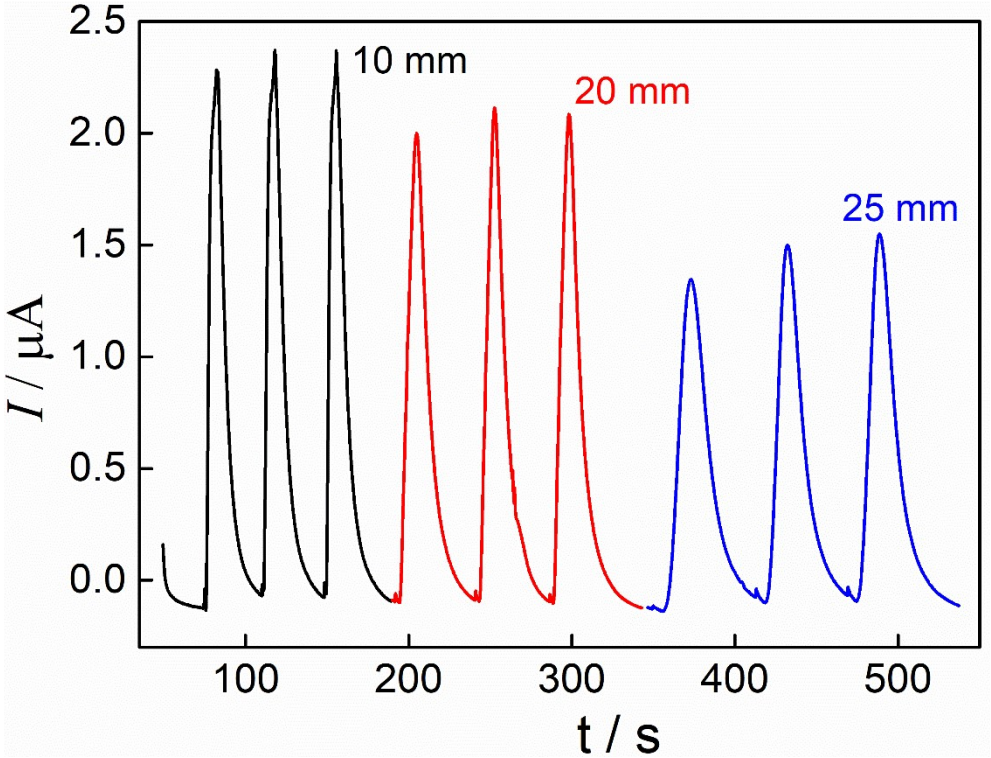

Figure S3: Transient current signals for injections of 5.0 µL of 1.0 mol L^{-1} $[Fe(CN)_6]^{4-}$ in 0.1 mmol L^{-1} KCl in analytical paths with different lengths. Carrier solution: 0.1 mmol L^{-1} KCl. $E_{detection}$ = +0.6 V *vs.* Pt. Outlet reservoir: 14 mm diameter containing 200 mg of cotton. Column liquid height in the inlet reservoir: 5 mm.

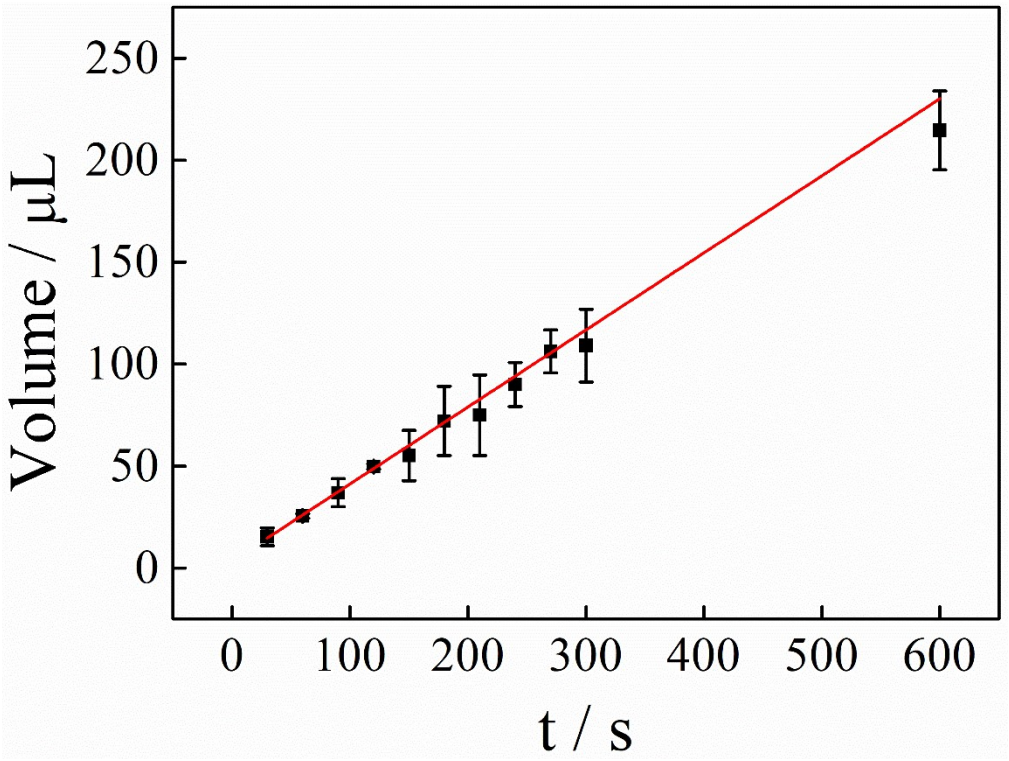

Figure S4: Volume of the carrier solutions transferred to the cotton piece at the outlet reservoir as a function of time. Carrier solution: 0.1 mol L^{-1} KCl. The plot was linear according to the equation: V(µL) = 3.39 + 0.38 t(s), R^2 = 0.993. Error bars correspond to the average value of three measurements.

Table S1 – Analytical parameters achieved for the selected analytes with the electrochemical thread in tube microfluidic device.

Analyte	Linear range / µmol L^{-1}	R^2	LOD / µmol L^{-1}	LOQ / µmol L^{-1}
Dopamine	10-150	0.995	6.8	22.7
H_2O_2	25-200	0.996	3.3	10.9
TBHQ	10-200	0.991	9.0	30.1

LOD and LOQ were estimated from the equations LOD = $3sd_B/S$ and LOQ = $10sd_B/S$, where S was the slope of the analytical curve and sd_B was the standard deviation for the blank response which was estimated from the standard deviation of the intercept from the analytical curve.

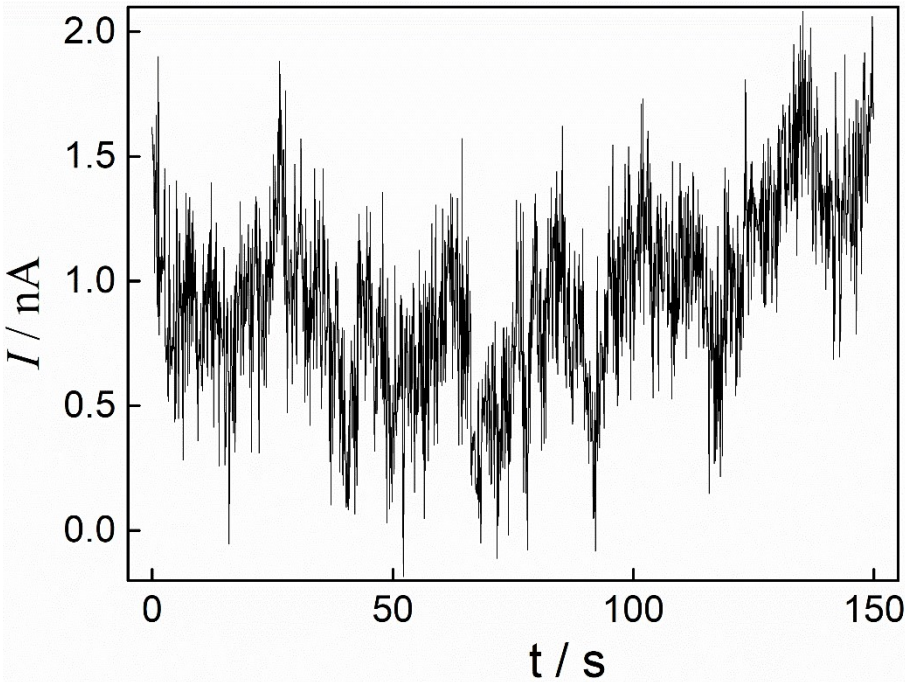

Figure S5: Baseline for the microfluidic device operating at +0.6 V with 0.1 mol L^{-1} KCl as the carrier solution.

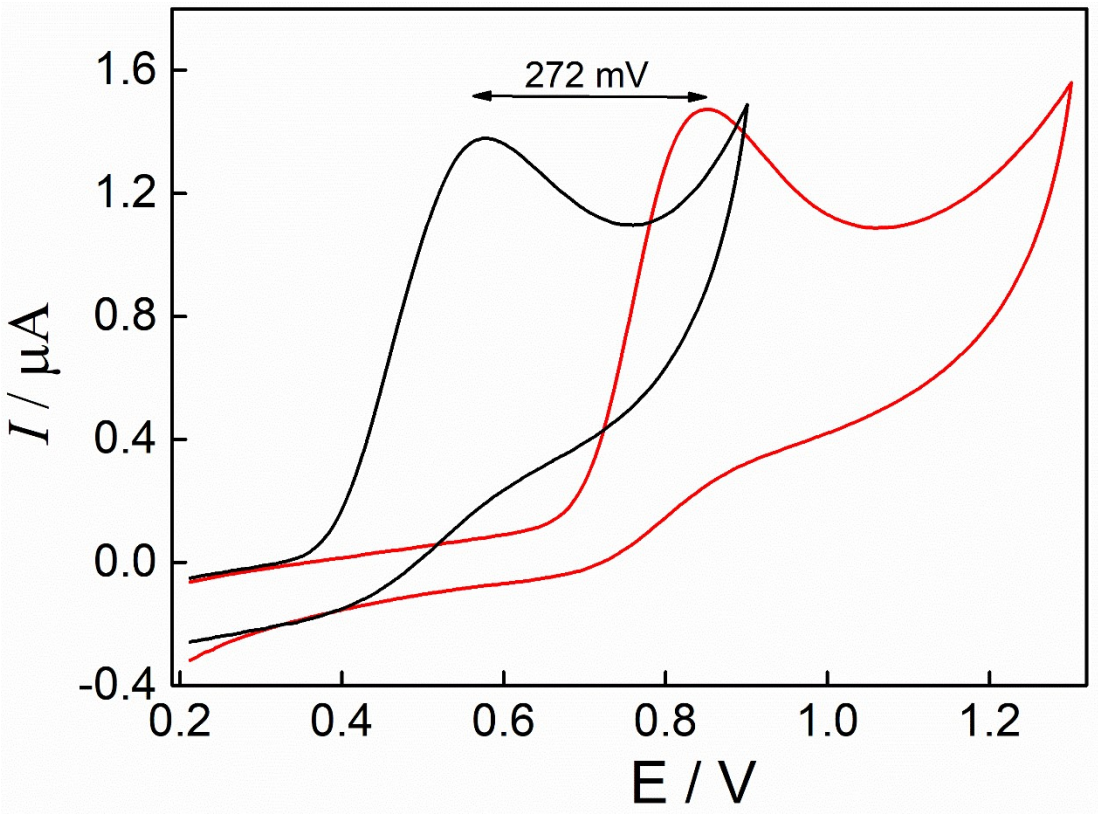

Figure S6: Cyclic voltammograms recorded in the presence of 1.0 mmol L^{-1} nitrite in 0.1 mol L^{-1} phosphate buffer solution (pH = 7) at 50 mV s^{-1}. Pt pseudo reference (black curve) and $Ag/AgCl/KCl_{saturated}$ reference electrode (red curve).

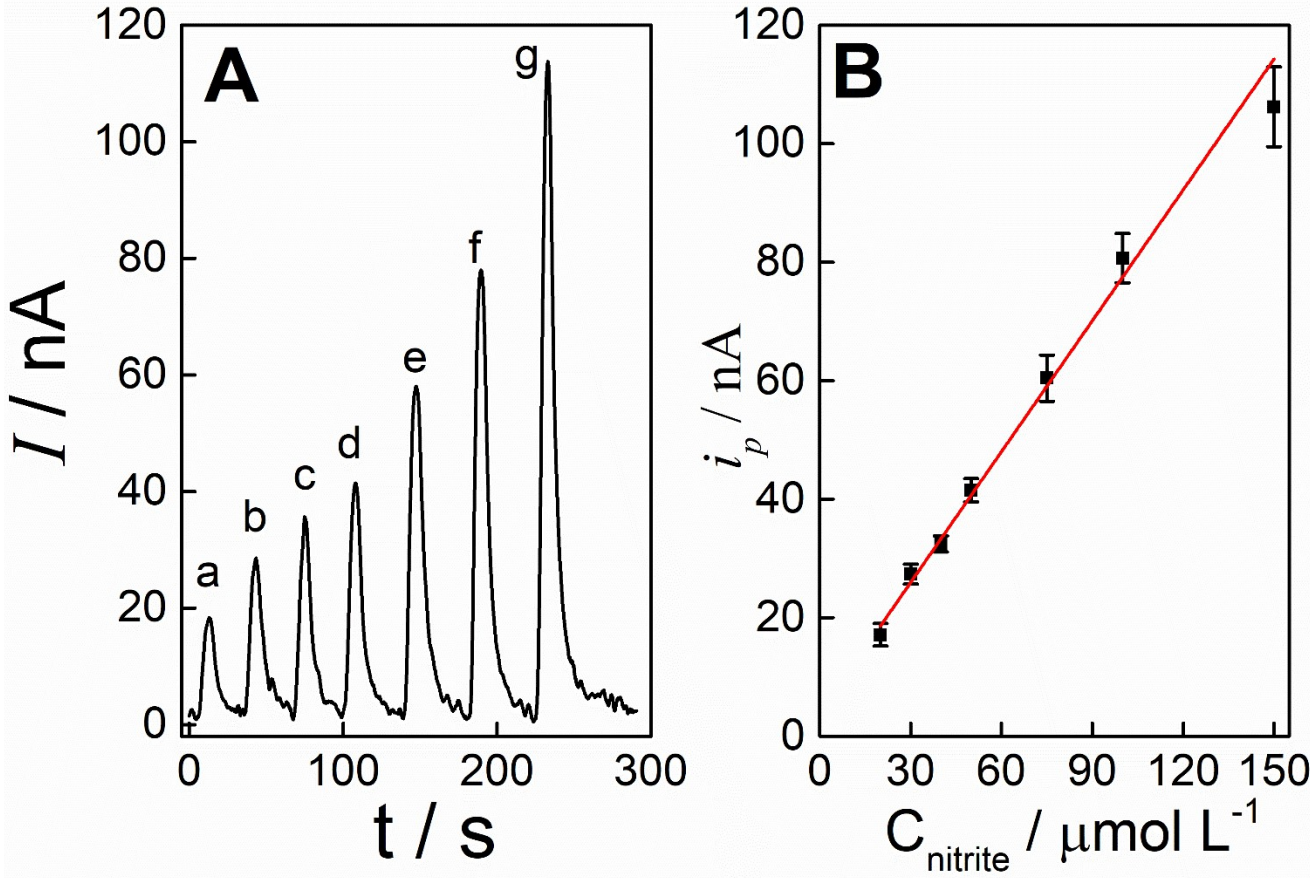

Figure S7: A) Amperometric responses for increasing concentrations of nitrite: a) 20; b) 30; c) 40; d) 50; e) 75; f) 100, and g) 150 µmol L^{-1}. B) Analytical curve for nitrite. Carrier solution: 0.1 mol L^{-1} phosphate buffer solution (pH = 7). $E_{detection}$ = +0.7 V *vs.* Pt. Outlet reservoir: 14 mm diameter containing 200 mg of cotton. Column liquid height in the inlet reservoir: 5 mm. Injection volume = 5 µL.

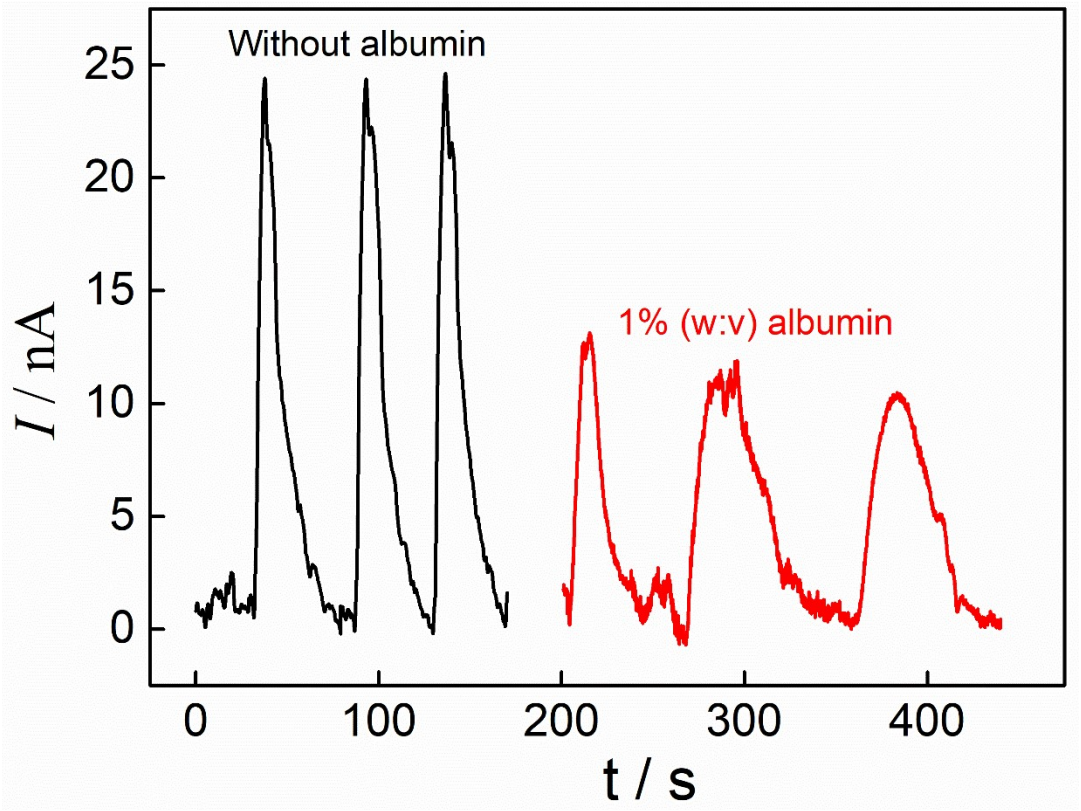

Figure S8: Transient current signals obtained for injections of synthetic saliva samples spiked with 50 µmol L^{-1} nitrite. Synthetic saliva sample prepared without bovine albumin (black curve) and with 1 % (w:v) of bovine albumin (red curve). Experimental conditions: $E_{detection}$ = +0.7 V vs. Pt. Carrier solution: 0.1 mol L^{-1} phosphate buffer solution (pH = 7.0). Injected volume = 5 µL, inlet reservoir height = 5 mm, diameter of the outlet reservoir = 14 mm, and mass of cotton at the outlet reservoir = 200 mg.