

Supplementary Materials: Electrochemical Detection of Dopamine Based on Functionalized Electrodes

Mathieu Ouellette ¹, Jessy Mathault ², Shimwe Dominique Niyonambaza ^{1,2}, Amine Miled ² and Elodie Boisselier ^{1,*}

¹ CUO-Recherche, Centre de recherche du CHU de Québec, Hôpital du Saint-Sacrement, Département d'ophtalmologie, Faculté de médecine, Université Laval, Québec, QC G3K 1A3, Canada

² Electrical and Computer Engineering Department, Faculty of Sciences and Engineering, Université Laval, Québec, QC G1V 0A6, Canada

* Correspondence: elodie.boisselier@fmed.ulaval.ca; Tel.: +1-418-682-7511 (ext. 84429)

Table S1. Functionalized electrodes for dopamine detection and their limit of detection (LOD).

Functionalization	LOD (μM)	Ref.
Porphyrin-functionalized graphene electrode	0.01	[25]
CTAB functionalized graphene oxide/multiwalled carbon nanotube composite modified electrode	1	[26]
Gold electrode with a polypyrrole-mesoporous silica molecular sieves film	0.7	[27]
Carbon quantum dots modified electrodes	2.7	[6]
Reduced graphene oxide/polyethylenimine on a gold microelectrode	0.05	[7]
Manganese tetraphenylporphyrin/reduced graphene oxide nanocomposite	0.008	[8]
Pretreated screen-printed carbon electrode with NaOH	0.1	[9]

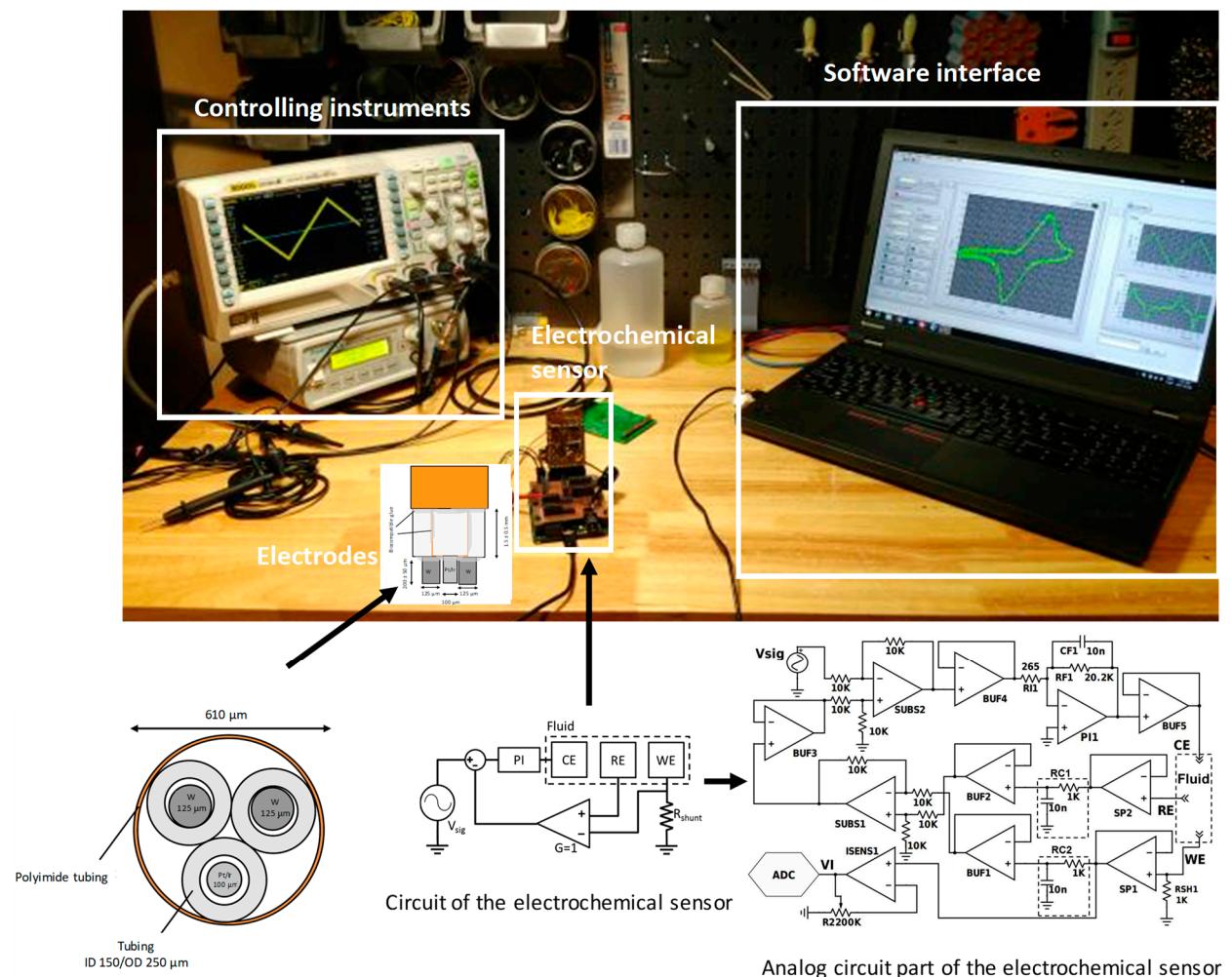


Figure S1. Schematic of the experimental setup of the in-house-built potentiostat. ADC: analog to

digital converter; BUF: buffer; CE: counter electrode; CF: amplifier feedback capacitor; G: amplifier gain; ID: inner diameter; ISENS: sensed current; OD: outer diameter; PI: proportional integrator electronic circuit; RC: low-pass filter resistor; RE: reference electrode; RF: amplifier feedback resistor; RI: amplifier integrator resistor; RSH: pull down resistor; R_{shunt} : shunt resistor; SP: buffer used to insulate the input from the electronic circuit; SUB: subtractor amplifier; V_{sig} : actuation/stimulation signal; WE: working electrode.

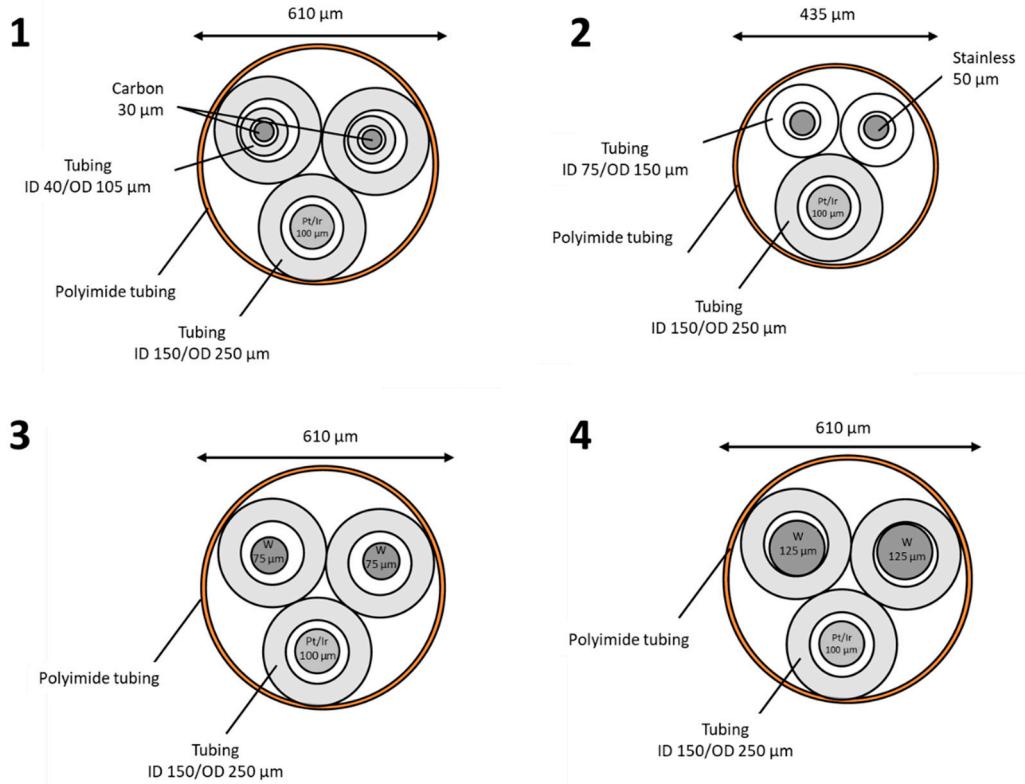


Figure S2. Geometry of the triple electrodes. 1: carbon triple electrode; 2: stainless triple electrode; 3: tungsten 75 triple electrode; 4: tungsten 125 triple electrode; ID: inner diameter; OD: outer diameter.

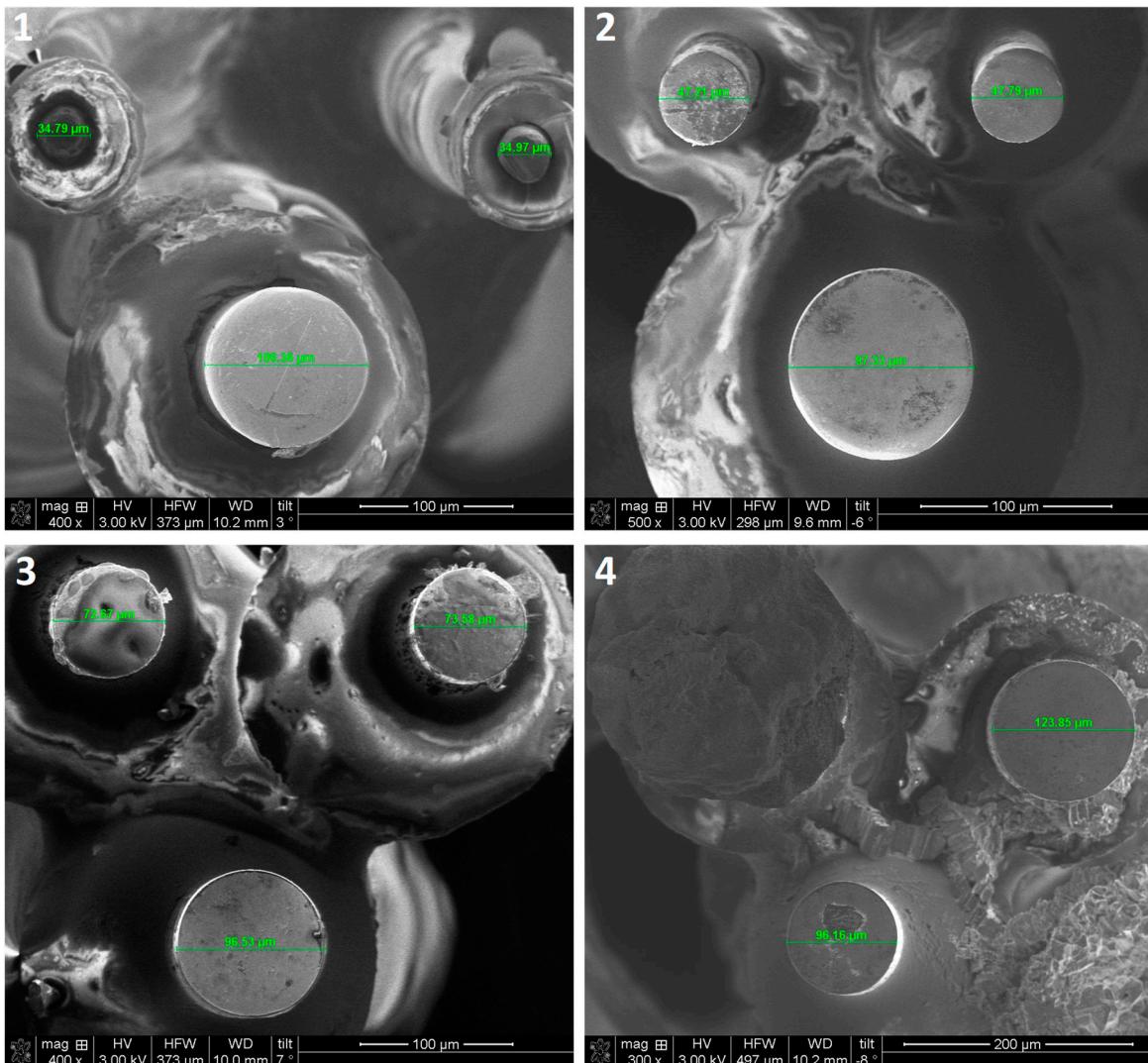


Figure S3. SEM images of the triple electrodes. 1: Carbon triple electrode; 2: Stainless triple electrode; 3: Tungsten 75 triple electrode; 4: Tungsten 125 triple electrode.

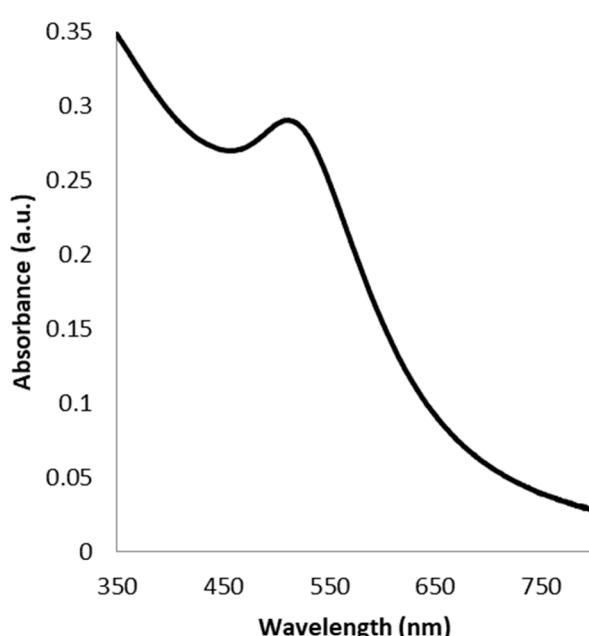


Figure S4. UV-visible spectrum of gold nanoparticles.

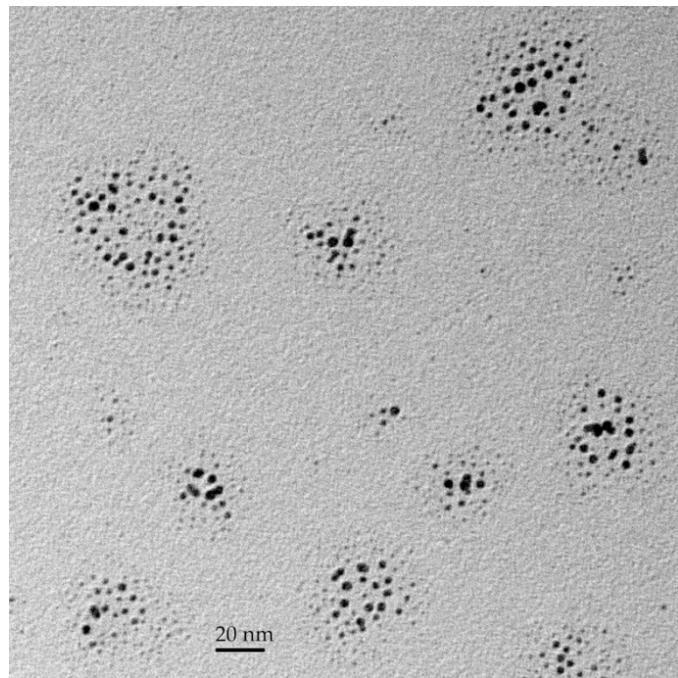


Figure S5. Transmission electron microscopy image of gold nanoparticles.

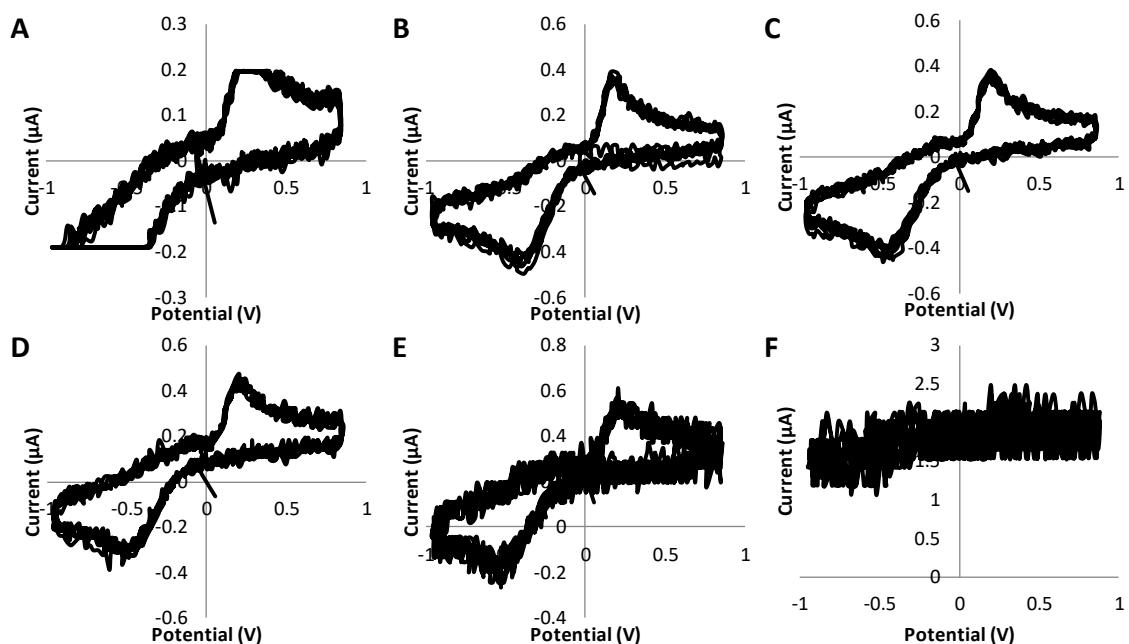


Figure S6. Voltammograms obtained for 10 mM dopamine using the carbon triple electrode with the in-house-built potentiostat. The values of the maximal sensed current are A) 0.1 μA ; B) 0.5 μA ; C) 1 μA ; D) 5 μA ; E) 10 μA and F) 50 μA .

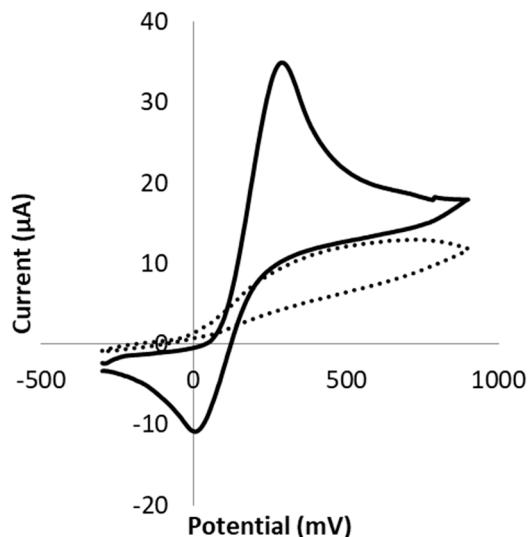


Figure S7. Voltammograms obtained for the analysis of 1 mM dopamine (solid black) and 1 mM ascorbic acid (dotted) for a commercial electrode functionalized with 0.01% m/V HAuCl₄ (in situ formation of gold nanoparticles).



© 2019 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).