The Platinization of Graphite Composites Turns Widespread and Low-Cost Materials into Hydrogen Peroxide Sensors and High-Value Biosensor Transducers

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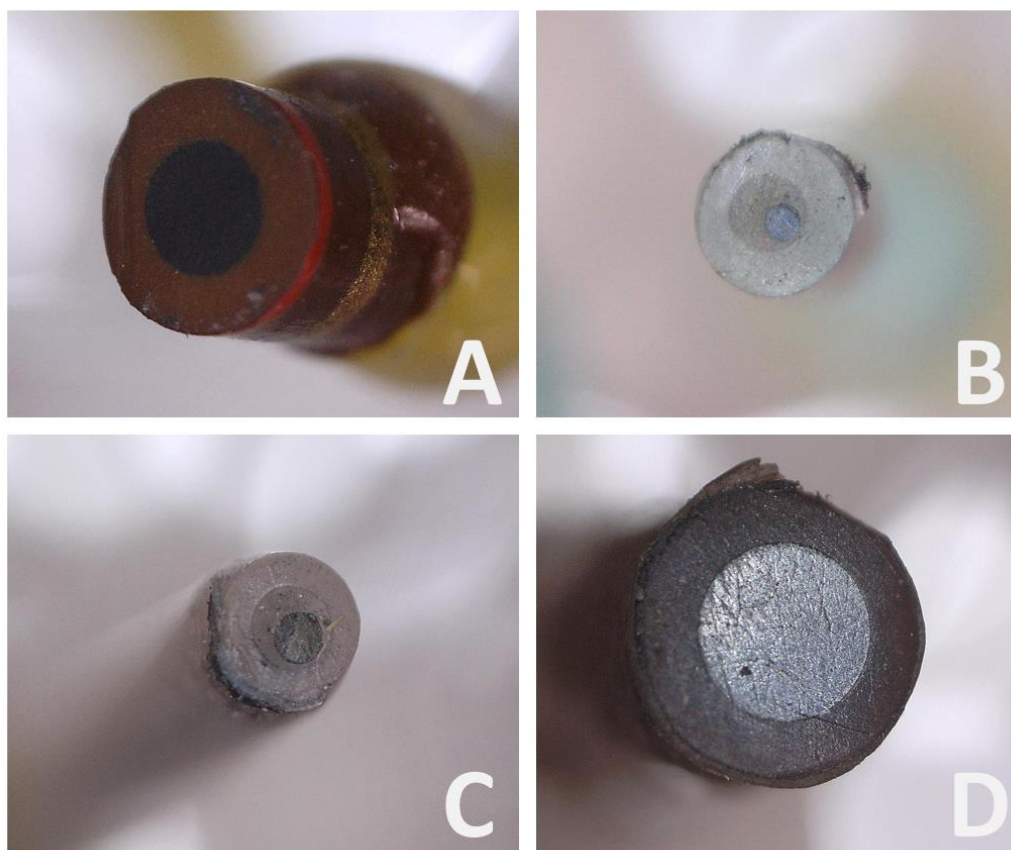***** Correspondence: grocchitta@uniss.it

Figure S1: Pictures of the carbonaceous sensors used in the present paper. A: Carbon composite resistor – 1.250 mm Ø; B: pencil lead – 0.3 mm Ø; C: pencil lead – 0.5 mm Ø; D: pencil lead – 2.0 mm Ø
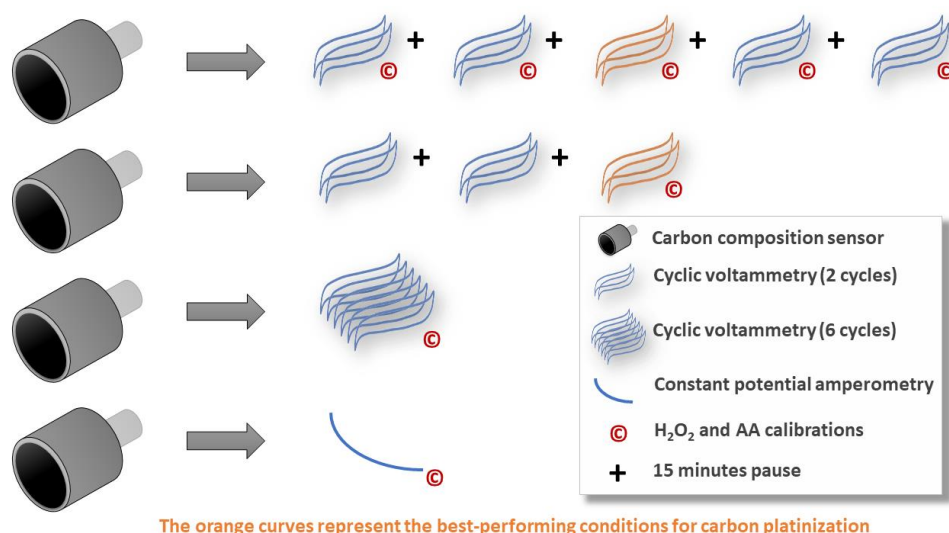
Figure S2: Scheme of the platinization protocols used in the present paper.
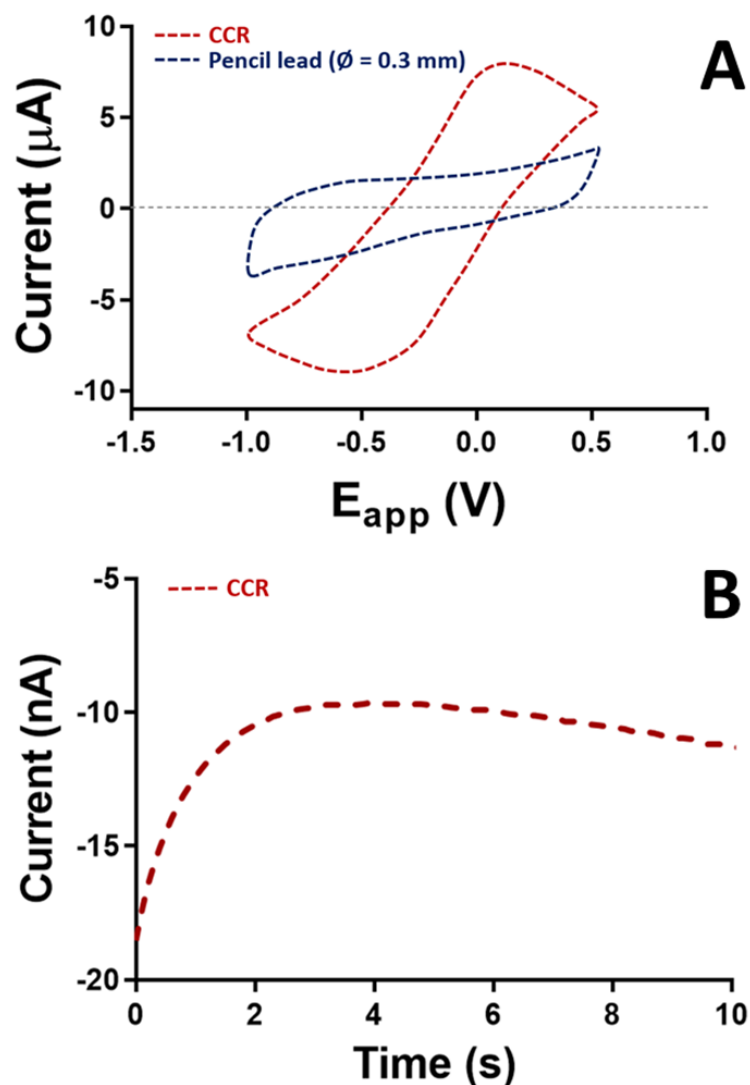
Figure S3: In Panel A is reported a representative CV cycle performed on CCR (red dotted line) and on PL (blue dotted line) obtained by applying the following parameters: $\Delta E = -1.0 \div +0.5$ V vs Ag/AgCl, scan rate = 0.75 Vs^{-1}. The voltammograms were obtained in a deoxygenated solution of HA 10 mM. In Panel B is highlighted the graph obtained by applying CPA parameters (E_{app}=-200 mV vs Ag/AgCl, t=10 seconds) on CCR.
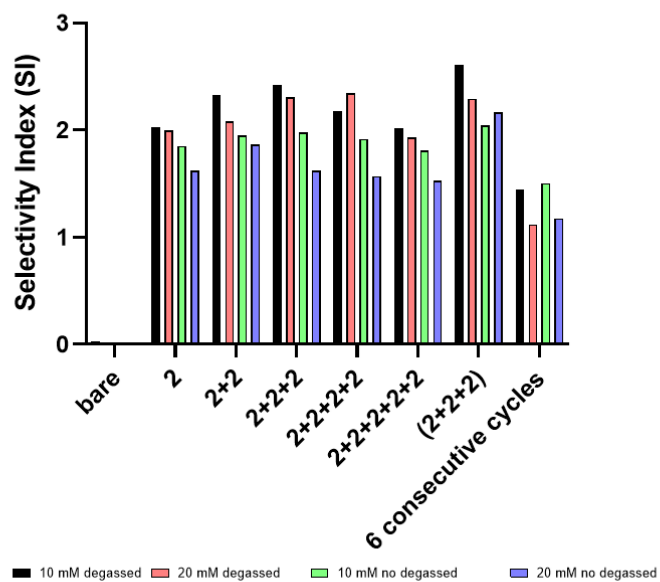
Figure S4: Selectivity Indexes (SI) calculated for all the CV platinization protocol used.

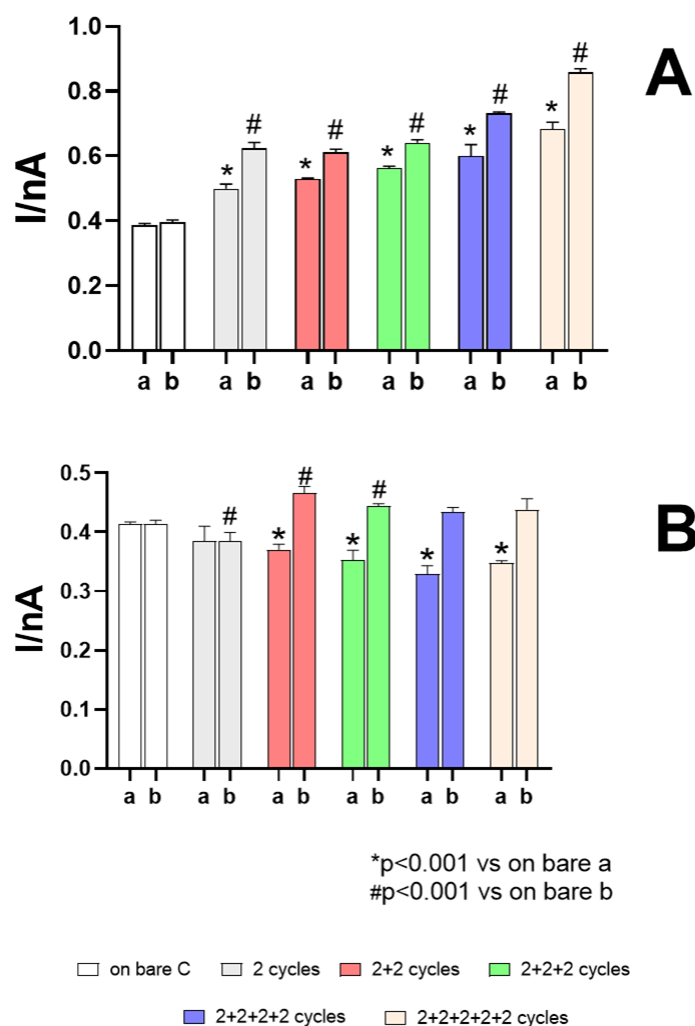Figure S5: AA slopes, expressed as nA/µM ± SEM, resulting from CV protocols after 2 cycles series using 10 mM (panel A) or 20 mM (panel B) HA solution deoxygenated (a) and no deoxygenated (b). n=4; *p<0.001 vs respective on bare a; #p<0.001 vs respective on bare b

Figure S6: AA slopes, expressed as nA/µM ± SEM, obtained from 2+2+2 CV cycles (Panel A) and CPA (Panel B) using different HA solutions: 1: on bare C; 2: HA 10 mM deoxygenated, 3: HA 20 mM deoxygenated, 4: HA 10 mM no-deoxygenated, 5: HA 20 mM no-deoxygenated. *p<0.001 vs on bare C.

Figure S7: HP (Panel A) and AA (Panel B) monitoring on microsensors obtained with 6 consecutive CV cycles. Slopes are given as nA/µM ± SEM; n=4; *p<0.001 vs 1.

Figure S8: Scanning electron micrographs of CCR carbonaceous surface (800X of magnification). In the inset the magnification (1800 X of magnification of an area with fine granulometry of the surface. The dashed curved line indicates the zone of separation between the carbon and ceramic surfaces.

Figure S9: Scanning electron micrographs of platinized CCR surface at different magnifications (1800 X panel A, 8830 X Panel B, 25000 X Panel C)

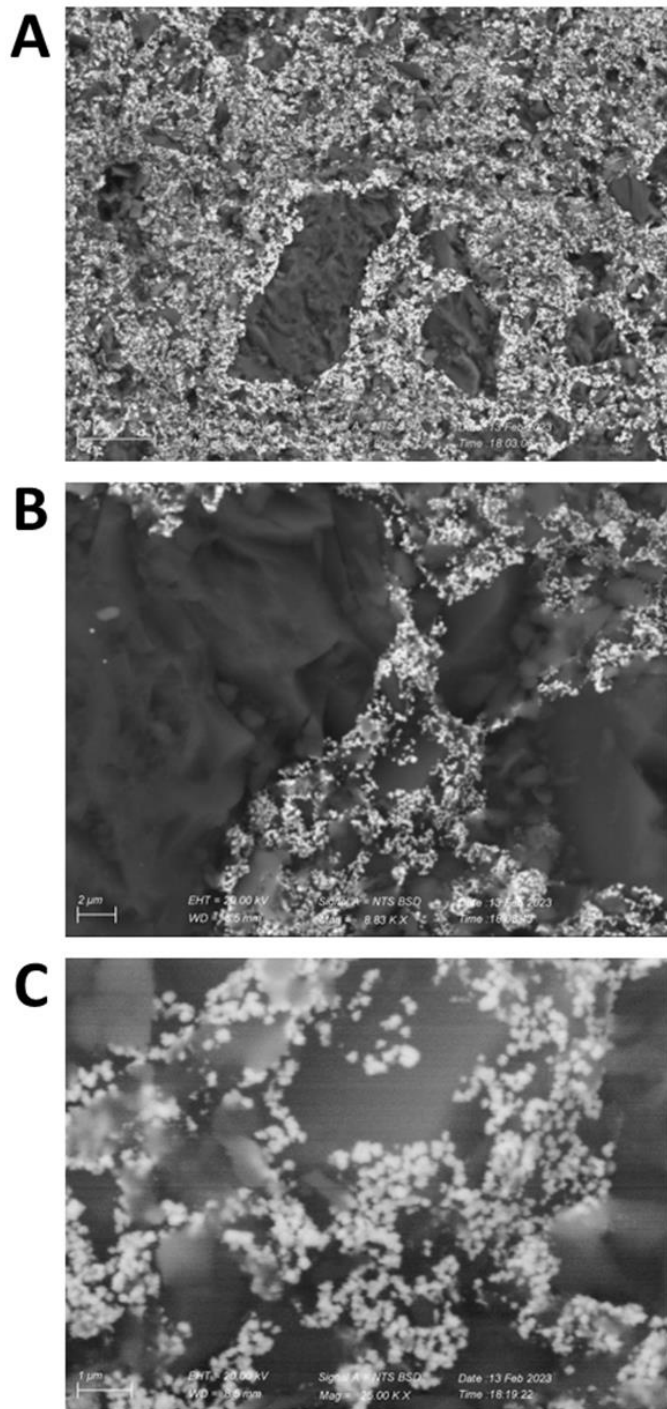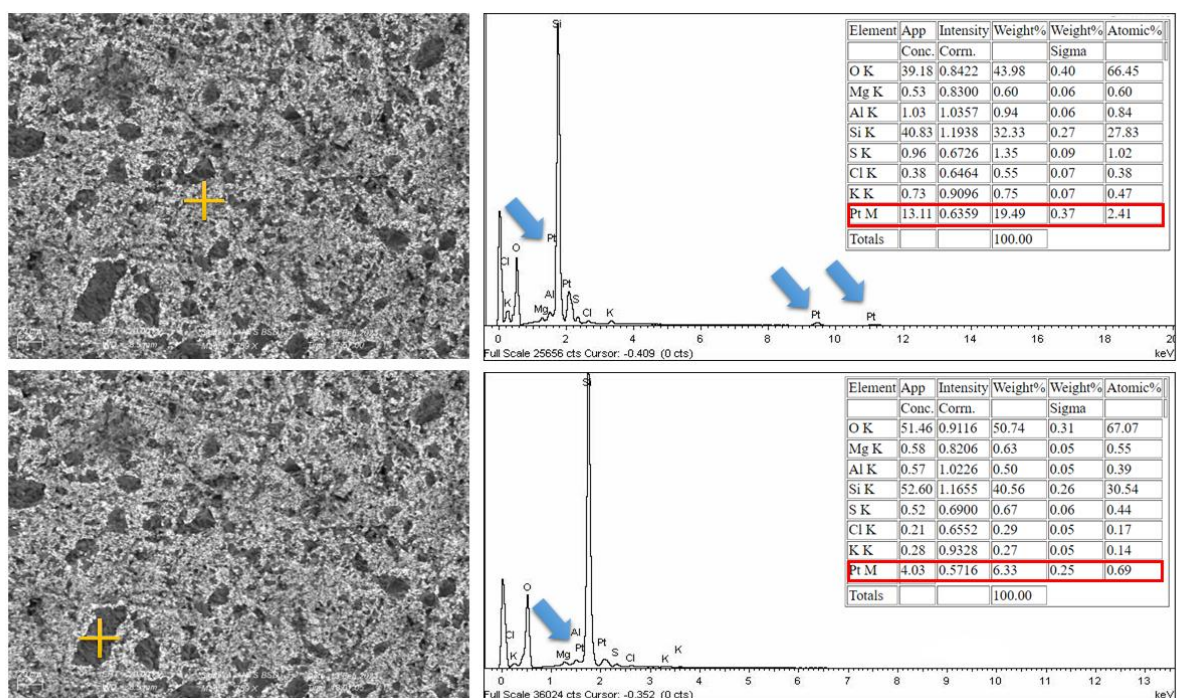| Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
O K	39.18	0.8422	43.98	0.40	66.45
Mg K	0.53	0.8300	0.60	0.06	0.60
Al K	1.03	1.0357	0.94	0.06	0.84
Si K	40.83	1.1938	32.33	0.27	27.83
S K	0.96	0.6726	1.35	0.09	1.02
Cl K	0.38	0.6464	0.55	0.07	0.38
K K	0.73	0.9096	0.75	0.07	0.47
Pt M	13.11	0.6359	19.49	0.37	2.41
Totals			100.00		

Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
O K	51.46	0.9116	50.74	0.31	67.07
Mg K	0.58	0.8206	0.63	0.05	0.55
Al K	0.57	1.0226	0.50	0.05	0.39
Si K	52.60	1.1655	40.56	0.26	30.54
S K	0.52	0.6900	0.67	0.06	0.44
Cl K	0.21	0.6552	0.29	0.05	0.17
K K	0.28	0.9328	0.27	0.05	0.14
Pt M	4.03	0.5716	6.33	0.25	0.69
Totals			100.00		

Figure S10: EDX Spectrometric analysis of selected areas of platinized CCR surface. On the left, scanning micrograph is shown, while on the right spectra and percentage composition is reported instead. The orange cross indicates the exact area where the the spectrometric analysis was carried out

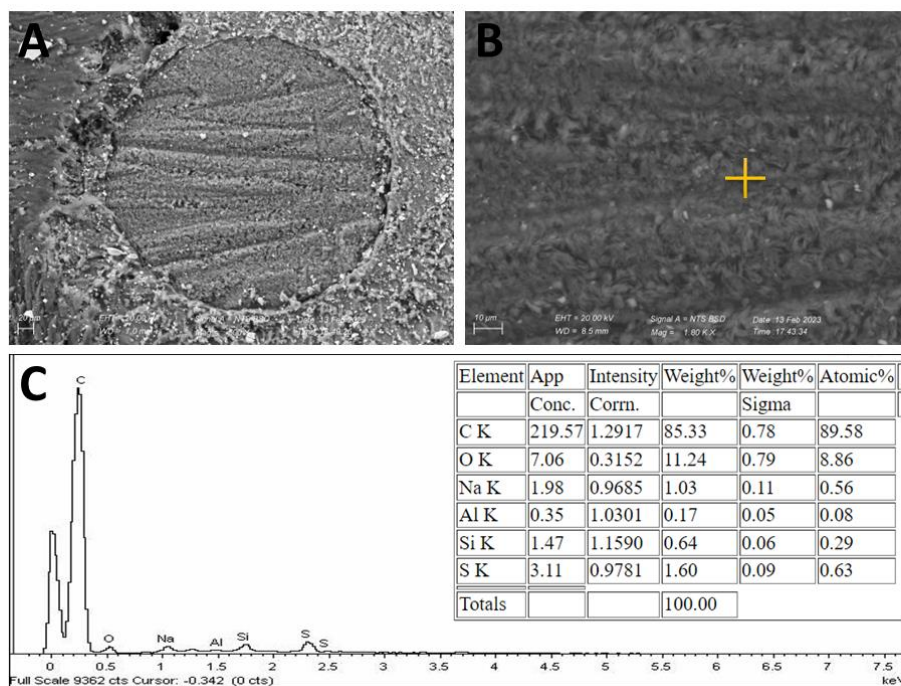| Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
C K	219.57	1.2917	85.33	0.78	89.58
O K	7.06	0.3152	11.24	0.79	8.86
Na K	1.98	0.9685	1.03	0.11	0.56
Al K	0.35	1.0301	0.17	0.05	0.08
Si K	1.47	1.1590	0.64	0.06	0.29
S K	3.11	0.9781	1.60	0.09	0.63
Totals			100.00		

Figure S11: Scanning electron micrographs of 0.3 mm Ø PL-based sensor at 800X (Panel A) and 1800X (Panel B) of magnification. In Panel C the EDX spectrometric analysis of a specific area of the surface is reported. The orange cross indicates the exact area where the spectrometric analysis was carried out
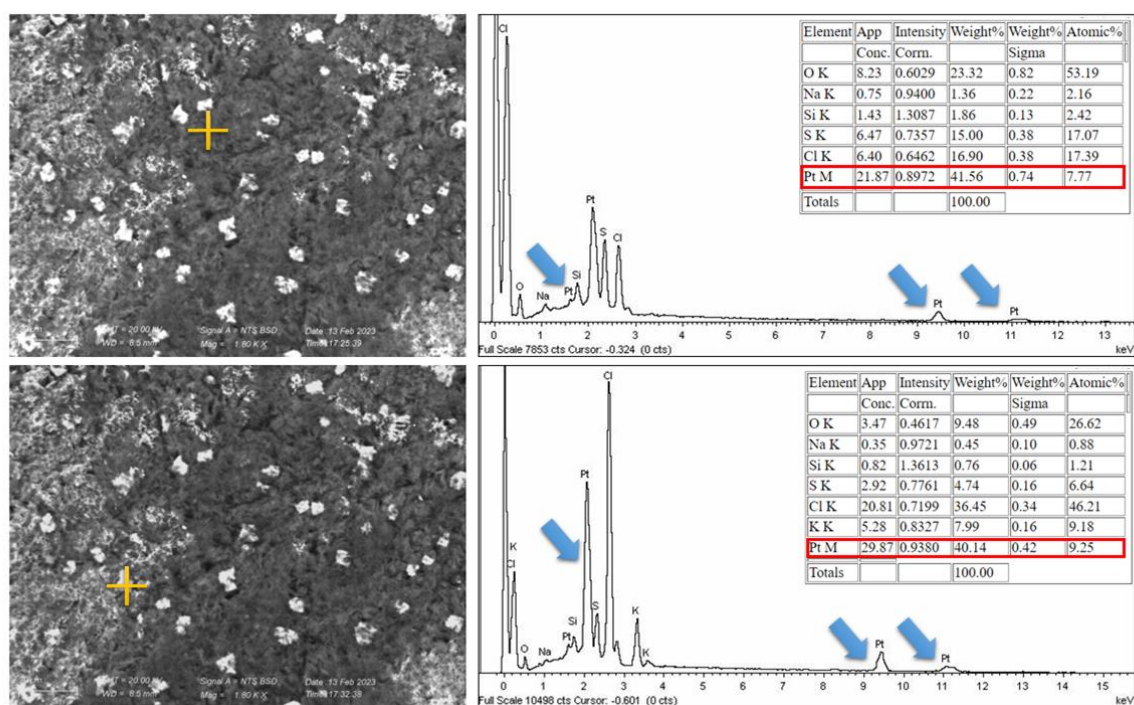
Figure S12 On the left, scanning electron micrographs of different regions of platinized 0.3 mm Ø PL-based sensor at 1800X of magnification. On the right, the spectrometric analysis of the latter surfaces.
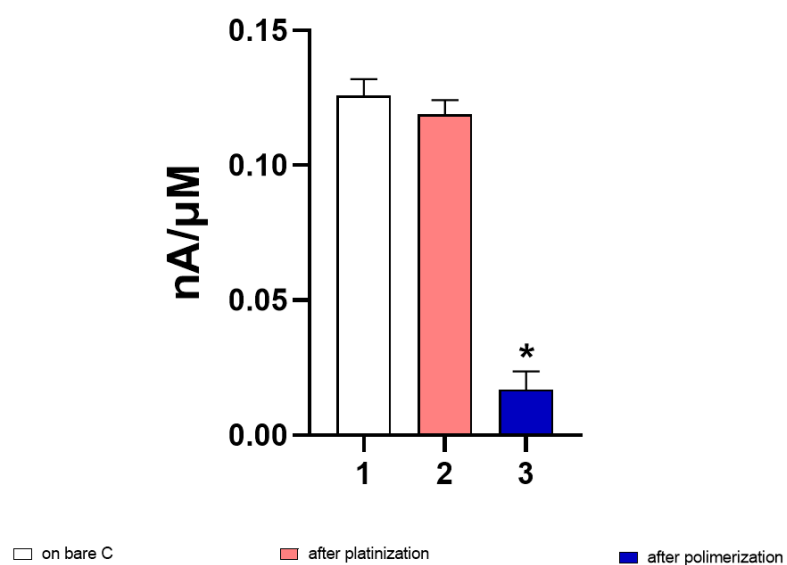
Figure S13: AA slopes, expressed as nA/µM ± SEM, calculated for PLs 0.3 mm of diameter before and after biosensor (n=4) construction. Data were obtained on bare C (white column), after platinization (red column) and after PPD deposition (blue column). *p<0.001 vs on bare C.