

Supporting information

Electrodeposition of nickel nanoflowers on screen-printed electrodes and its application to non-enzymatic determination of sugars

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S1. Comparison between the galvanostatic and potentiostatic methods

In order to compare the response of the devices after the electrodeposition of nickel by the galvanostatic and potentiostatic methods under similar conditions, the latter was taken as reference. The chronopotentiogram obtained (**Figure S1**) shows that the potential taken for the working electrode while the application of $-25 \mu\text{A}$ for 60 s in a solution of 10 mM Ni(II) (0.1 M NaCl) is kept during the most time between -0.94 and -0.91 V. Therefore, in order to perform the electrodeposition in similar conditions, -0.92 V was applied for 60 s (potentiostatic method). Although the chronopotentiometric curve is not fully constant and has nonlinear variation, these conditions could be appropriate to obtain a similar electrodeposition. Several electrodes were prepared using both method and the electrode activation was performed by 50 voltammetric cycles as described in the main manuscript. The devices were used to measure a blank solution (0.1 M NaOH) and a 1 mM glucose solution (in 0.1 M NaOH) under optimized conditions ($+0.6\text{V}$ for 100 s). **Table S1** shows the current obtained and the reproducibility in terms of the relative standard deviation (RSD). The electrocatalytic effect is similar in both cases, however the response for the blank solution is slightly more reproducible for the galvanostatic method. In this case, it seems that the potential of the quasireference electrode remains constant (and reproducible) under these conditions (0.1 M NaCl) as the differences found are small. However, it is likely that in severe conditions such as in strong acidic media, the galvanostatic method probably offers better results in terms of reproducibility than the potentiostatic one, since the silver material of the quasireference electrode could suffer some superficial changes, being difficult to maintain a constant applied potential.

Table S1. Chronoamperometric response and RSD for a blank and 1 mM glucose solution using electrodes modified by the potentiostatic and galvanostatic electrodeposition methods.

	Blank response (μA)	RSD	1 mM glucose response (μA)	RSD
Potentiostatic	2.2 ± 0.2	10.5%	26.5 ± 0.4	1.3%
Galvanostatic	2.1 ± 0.1	7.1%	26.2 ± 0.7	2.6%

S2. Experimental details for the electrodeposition of spherical nickel nanoparticles

As described in the main manuscript, under certain conditions, nickel nanoparticles with spherical geometry were obtained (Figure 3). The electrodeposition to generate this kind of nanoparticles was carried out using a solution of 10 mM of Ni(II) (from NiSO₄) in 0.1 M H₃BO₃/NaCl and applying -25 μ A for 60 s. As shown in Figure 3, the presence of H₃BO₃ allows the generation of nickel nanoparticles with a different geometric shape (spherical) than for the electrodeposition in the absence of H₃BO₃ (nanoflowers shape). However, in these conditions the reproducibility was worse, and therefore, the electrode modified with nickel nanoflowers was employed.

S3. Other supporting figures

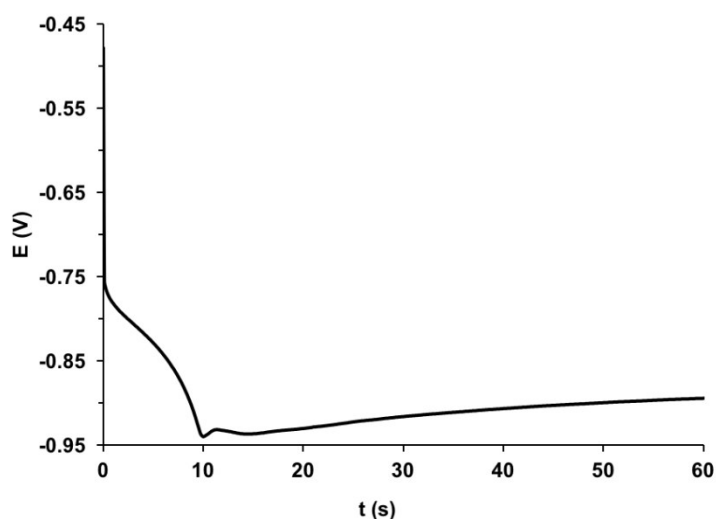


Figura S1. Chronopotentiogram obtained for the electrodeposition of nickel (10 mM in 0.1 M NaCl) on screen-printed electrodes applying -25 μ A for 60 s.

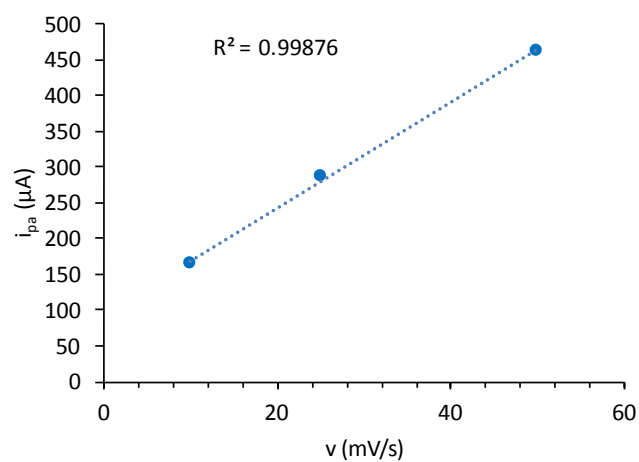


Figure S2. Relationship between the anodic peak current and the the scan rate (10, 25, 50 mV/s) for a NiNFSPE in 0.1 M NaOH.

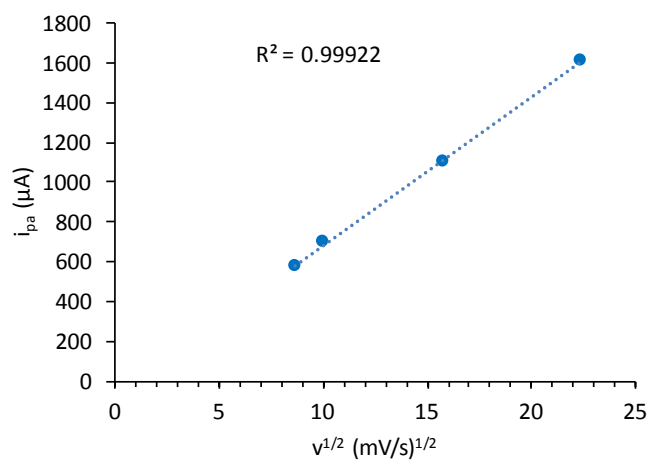


Figure S3. Relationship between the anodic peak current and the square root of the scan rate (75, 100, 250, 500 mV/s) for a NiNFSPE in 0.1 M NaOH.

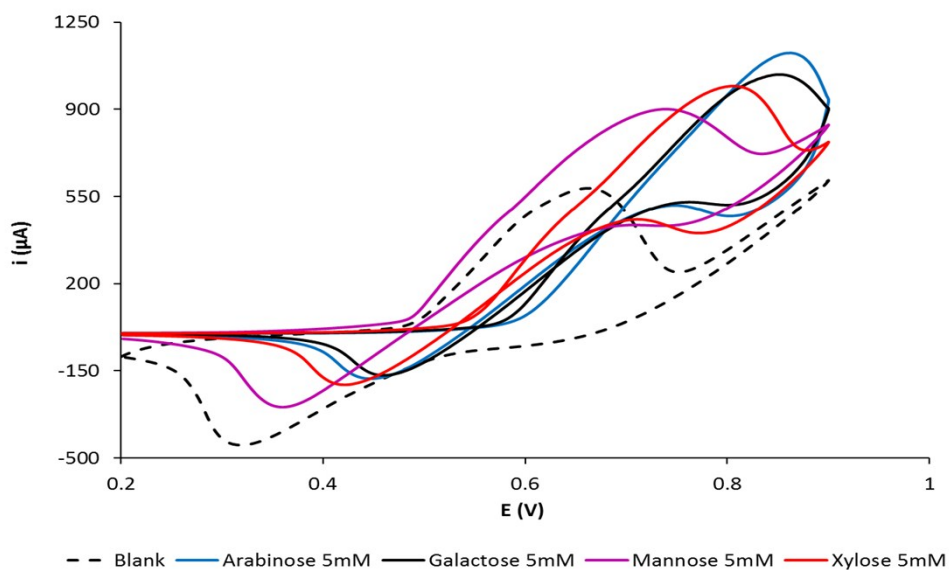


Figure S4. Cyclic voltammetry of 5 mM sugars (arabinose, galactose, mannose, xylose) and 0.1 M NaOH obtained at nickel nanoflowers-modified screen-printed electrodes.

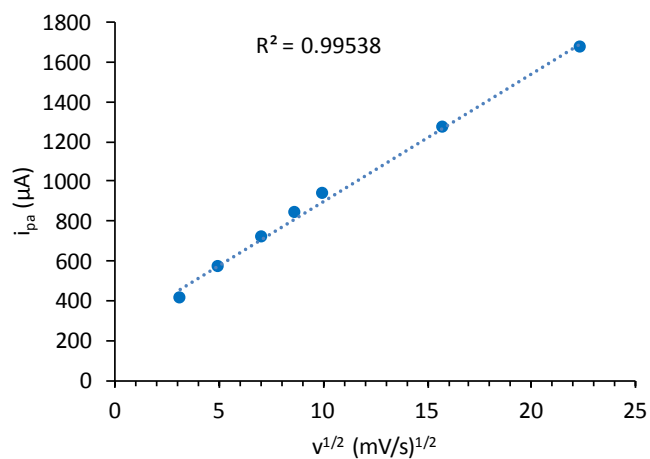


Figure S5. Relationship between the anodic peak current and the square root of the scan rate for a NiNFSPE in presence of 5 mM of glucose.

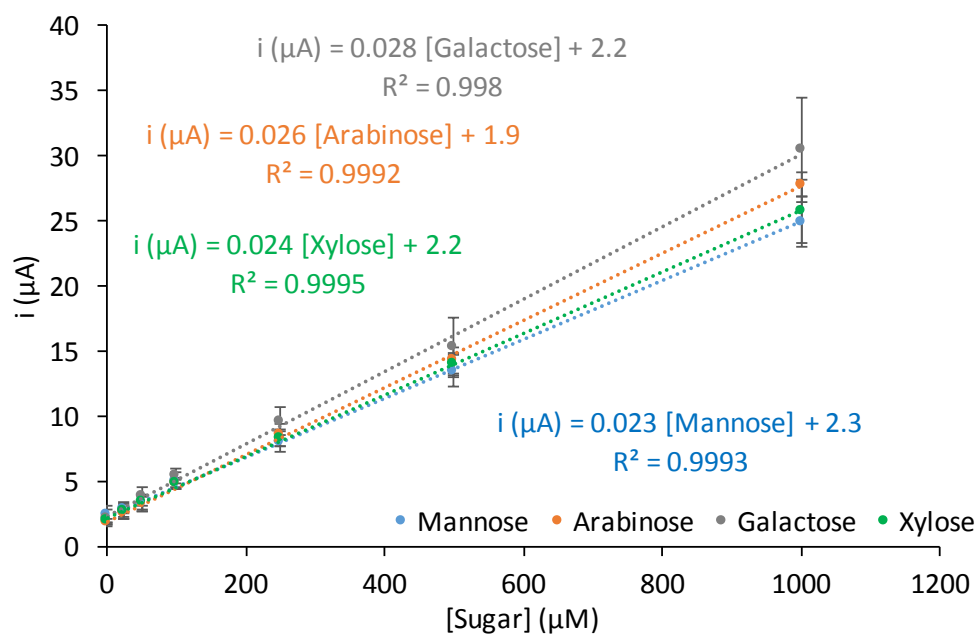


Figure S6. Calibration plots for arabinose, galactose, mannose and xylose.