

# Batch-Injection Amperometric Determination of Glucose Using a $\text{NiFe}_2\text{O}_4$ /Carbon Nanotube Composite Enzymeless Sensor

Amanda B. Nascimento <sup>1</sup>, Lucas V. de Faria <sup>1,2</sup>, Tiago A. Matias <sup>1,3</sup>, Osmando F. Lopes <sup>1</sup> and Rodrigo A. A. Muñoz <sup>1,\*</sup>

<sup>1</sup> Institute of Chemistry, Federal University of Uberlândia, Uberlândia 38400-902, MG, Brazil; amandabnascimento842@gmail.com (A.B.N.); lucasviniciusfaria@gmail.com (L.V.d.F.); tiago.matias@ufes.br (T.A.M.); osmando@ufu.br (O.F.L.)

<sup>2</sup> Institute of Chemistry, Department of Analytical Chemistry, Fluminense Federal University, Niterói 24020-141, RJ, Brazil

<sup>3</sup> Chemistry Department, Federal University of Espírito Santo—UFES, Vitória 29075-910, ES, Brazil

\* Correspondence: munoz@ufu.br

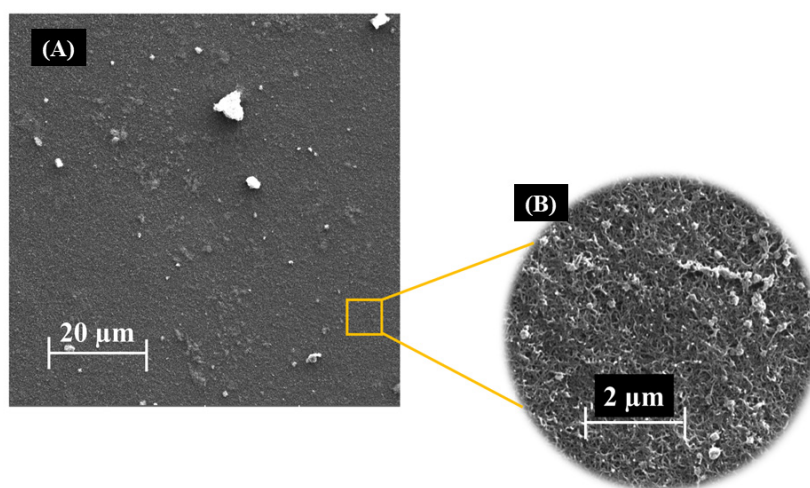
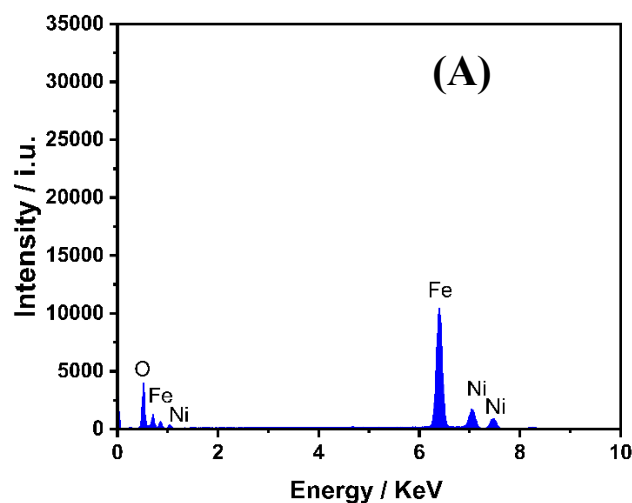


Figure S1. SEM images of (A)  $\text{NiFe}_2\text{O}_4$ @MWCNT composite and (B) functionalized MWCNT.



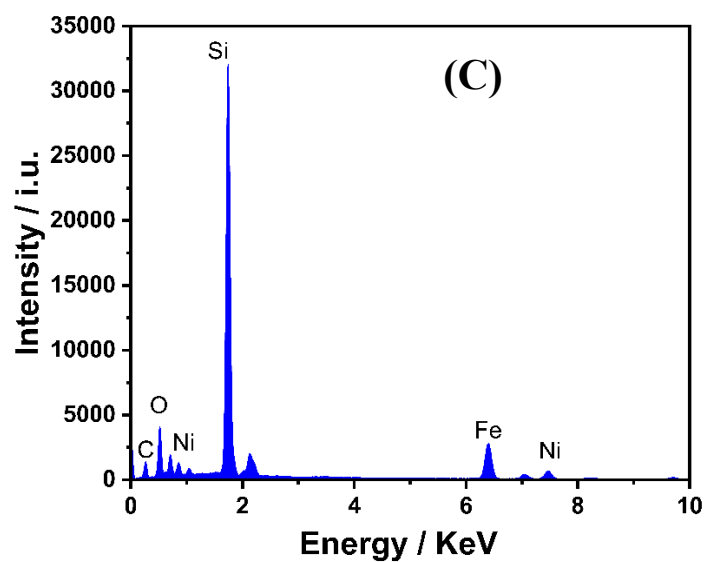
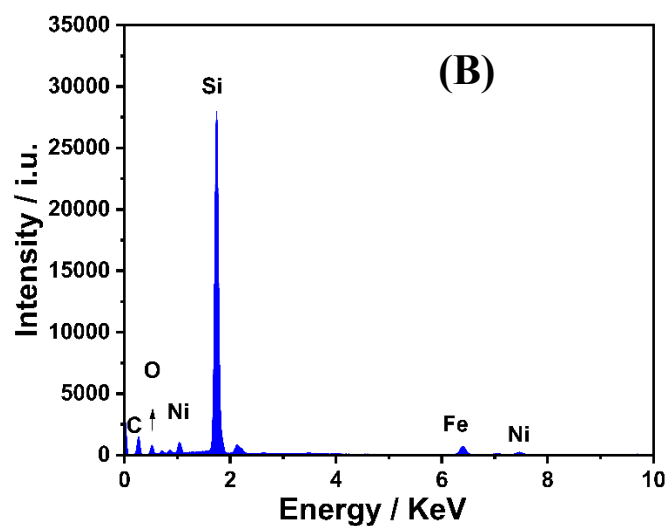


Figure S2. EDS spectrum of NiFe<sub>2</sub>O<sub>4</sub> (A); MWCNT (B) and NiFe<sub>2</sub>O<sub>4</sub>@MWCNT composite (C).

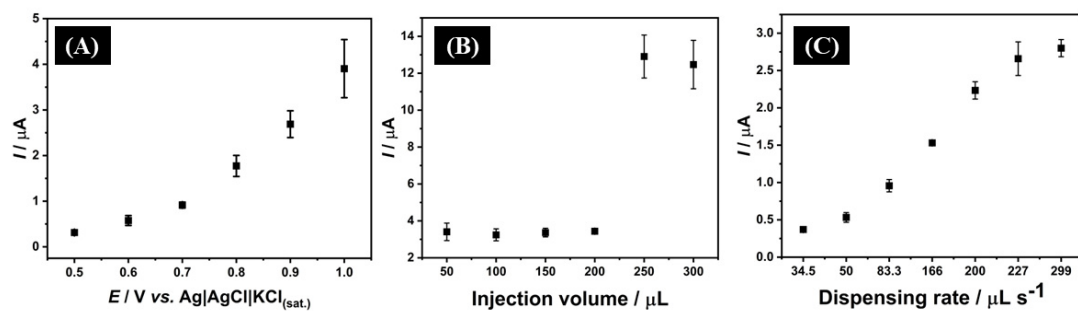
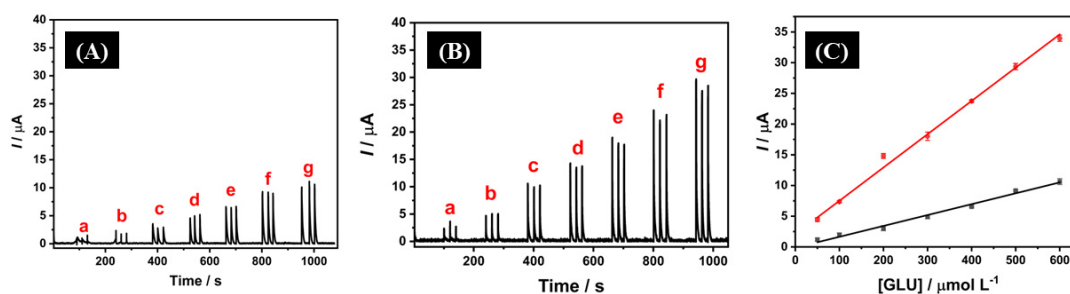
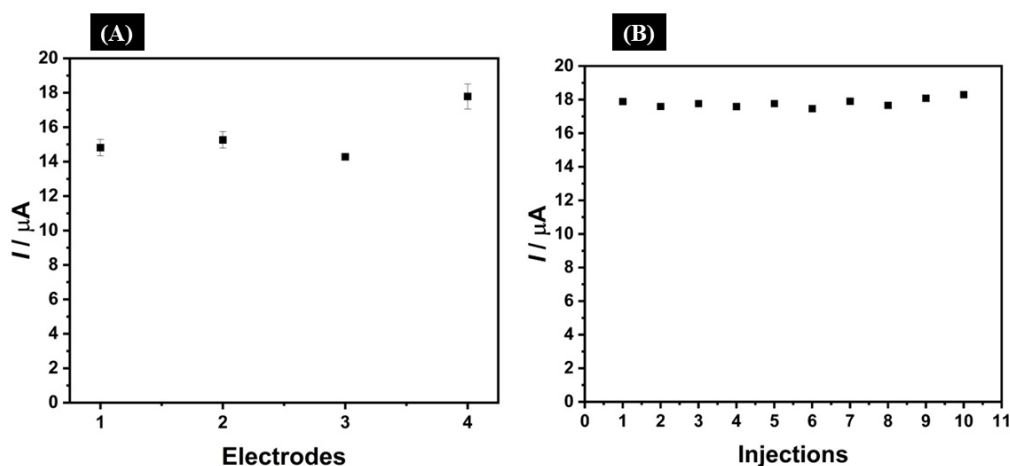


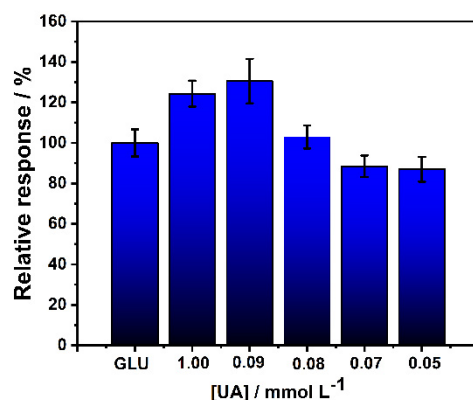
Figure S3. Impact of the BIA-AD parameters (A) applied potential, (B) injection volume, and (C) dispensing rate on the electrochemical response of 100  $\mu\text{mol L}^{-1}$  GLU.



**Figure S4.** Amperometric response using BIA-AD system for GLU injections ( $n = 3$ ) with concentrations of (a) 50; (b) 100; (c) 200; (d) 300; (e) 400; (f) 500 and (g) 600  $\mu\text{mol L}^{-1}$  on the (A) MWCNT/GCE and (B)  $\text{NiFe}_2\text{O}_4/\text{MWCNT}/\text{GCE}$  electrodes. (C) Calibration curves obtained from 50 to 600  $\mu\text{mol L}^{-1}$  GLU using  $\text{NiFe}_2\text{O}_4/\text{MWCNT}/\text{GCE}$  (red line) and MWCNT/GCE (black line). Supporting electrolyte: 1.0 mol  $\text{L}^{-1}$  NaOH, applied potential: + 0.9 V, injection volume: 250  $\mu\text{L}$  and dispensing rate: 299  $\mu\text{L s}^{-1}$ .



**Figure S5.** (A) Reproducibility study (inter-electrodes,  $n = 4$ ) using 300  $\mu\text{mol L}^{-1}$  GLU with  $\text{NiFe}_2\text{O}_4/\text{MWCNT}/\text{GCE}$  coupled to the BIA-AD system. (B) Repeatability study (intra-electrodes,  $n = 10$ ) using 300  $\mu\text{mol L}^{-1}$  GLU with  $\text{NiFe}_2\text{O}_4/\text{MWCNT}/\text{GCE}$  coupled to the BIA-AD system.



**Figure S6.** Relative amperometric response for GLU (1.00 mmol  $\text{L}^{-1}$ ) before (first bar named as GLU) and after the addition of UA at different concentrations (from 1.00 to 0.05 mmol  $\text{L}^{-1}$ ).