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Ni(II)-modified solid substrates as a platform to adsorb His-tag proteins

Laura E. Valenti[a,#], Vitor L. Martins[b,#], Elisa Herrera[a], Roberto M. Torresi[b], Carla E. Giacomelli[a,*]

a- Instituto de Investigaciones en Físico Química de Córdoba (INFIQC) CONICET-UNC, Departamento de Fisicoquímica, Facultad de Ciencias Químicas, Universidad Nacional de Córdoba, Ciudad Universitaria, X5000HUA Córdoba Argentina.

b- Instituto de Química - Universidade de São Paulo – Av. Prof. Lineu Prestes 748, 05508-000 São Paulo, SP, Brazil

[#] Both authors contributed equally to this manuscript.

*Corresponding author.

Supplementary information

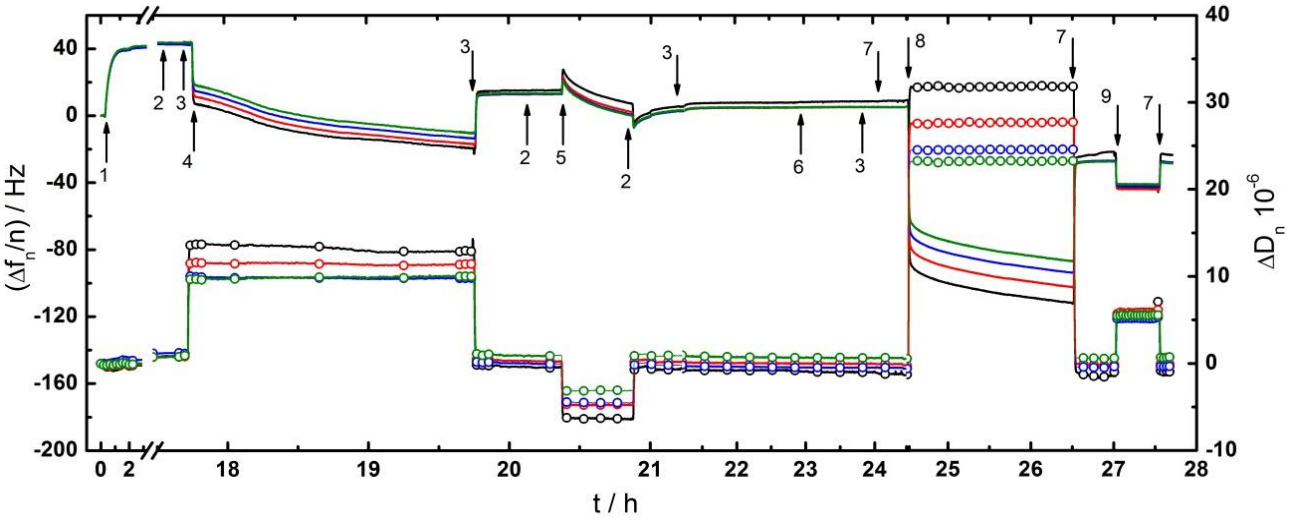

Figure S1: QCM-D *in situ* response given by Δf_n (lines, left axis) and ΔD_n (line + symbols, right axis) at overtones (n) 5 (black), 7 (red), 9 (blue), and 11 (green) for the five steps involved in the modification of the gold substrates: I: cysteamine in absolute ethanol (arrow 1), II: glutaraldehyde in pyridine buffer (arrow 4); III: Ac_2O in absolute etanol (arrow 5); IV: aqueous solution of $NaBH_4$ (arrow 6); and V: aqueous solution of Ni(II) (arrow 8). The last step represents the addition of a 0.2 mol L^{-1} KNO_3 solution (arrow 9). The arrows 2, 3 and 7 indicate the addition of absolute ethanol, pyridine buffer, and water, respectively.

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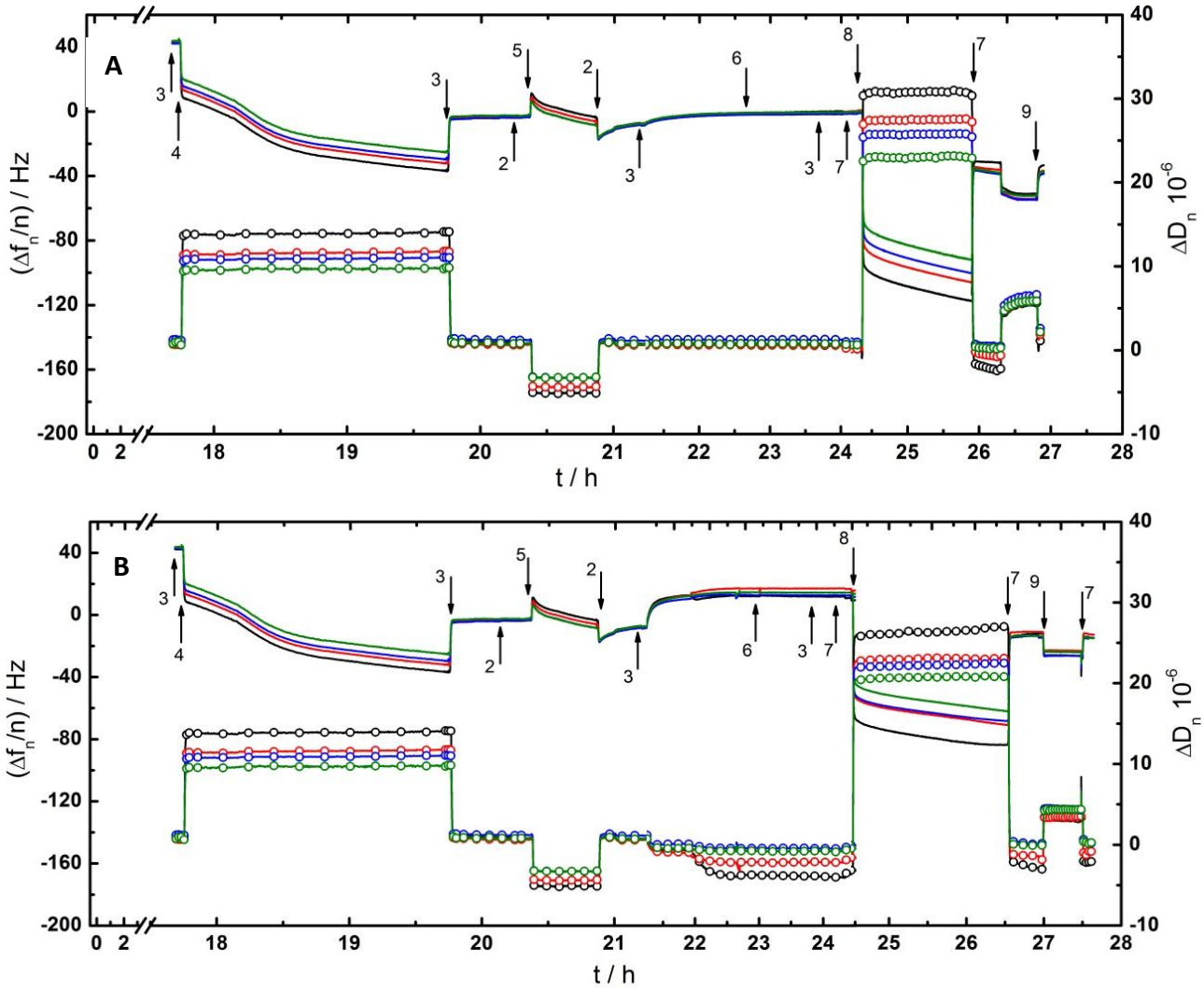

Figure S2: QCM-D *in situ* response given by Δf_n (lines, left axis) and ΔD_n (line + symbols, right axis) at overtones (n) 5 (black), 7 (red), 9 (blue), and 11 (green) for the five steps involved in gold modification in absence of cysteamine: II: glutaraldehyde in pyridine buffer (arrow 4); III: Ac_2O in absolute etanol (arrow 5); IV: aqueous solution of $NaBH_4$ (arrow 6); V: aqueous solution of Ni(II) (arrow 8). The last step represents the addition of a 0.2 mol L^{-1} Histidine (A) or 1.0 mol L^{-1} KNO_3 (B) addition (arrow 9). The arrows 2, 3 and 7 indicate the addition of absolute ethanol, pyridine buffer and water, respectively.

This figure shows the experiment control corresponding to Figure 3 and S1, all the modifications were carried out without the first step (cysteamine – gold reaction), so the modification starts from glutaraldehyde (step II) until Ni(II) addition (step V). Note that the experiment starts at 17 hours, and the Δf_n and ΔD_n start in 43 Hz and 0.75 10^{-6}, respectively, in order to compare with the complete modification.

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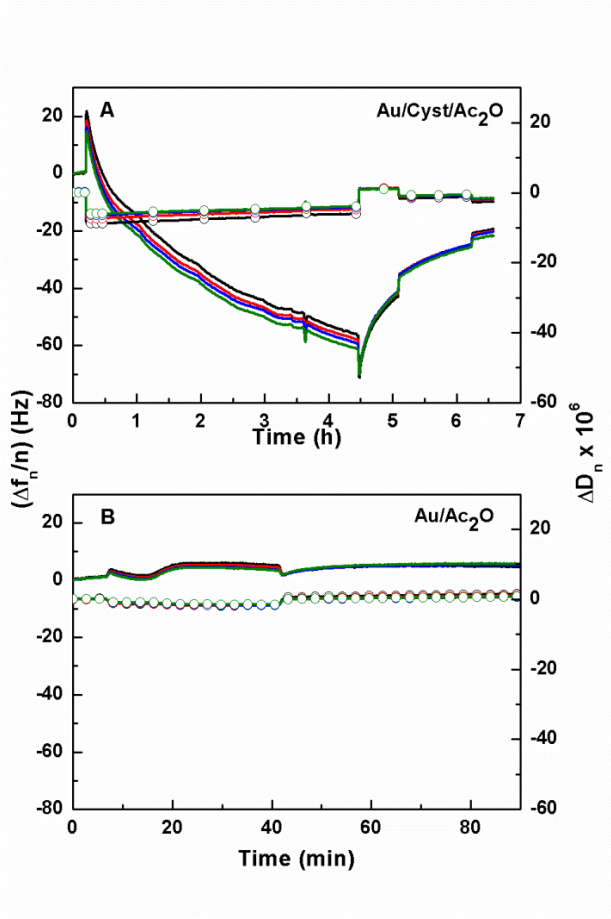

Figure S3: QCM-D in situ response given by Δf_n (lines, left axis) and ΔD_n (line + symbols, right axis) at overtones (n) 5 (black), 7 (red), 9 (blue), and 11 (green) for the Ac_2O addition to Au/Cyst (A) and Au (B) substrates. Note that time scale is different between these experiments.

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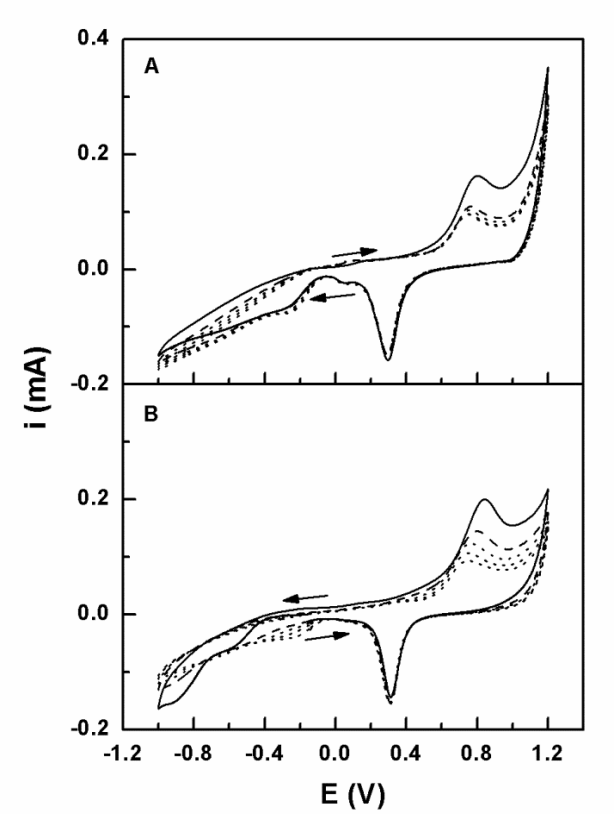

Figure S4: CV of Au/Cyst electrode for different potential cycles (first (solid line), second (dashed line) and third to fifth (dotted line) cycles) in 50 mM phosphate buffer pH 8.0 at 100 mV/s. The arrows indicate the direction of the scans.

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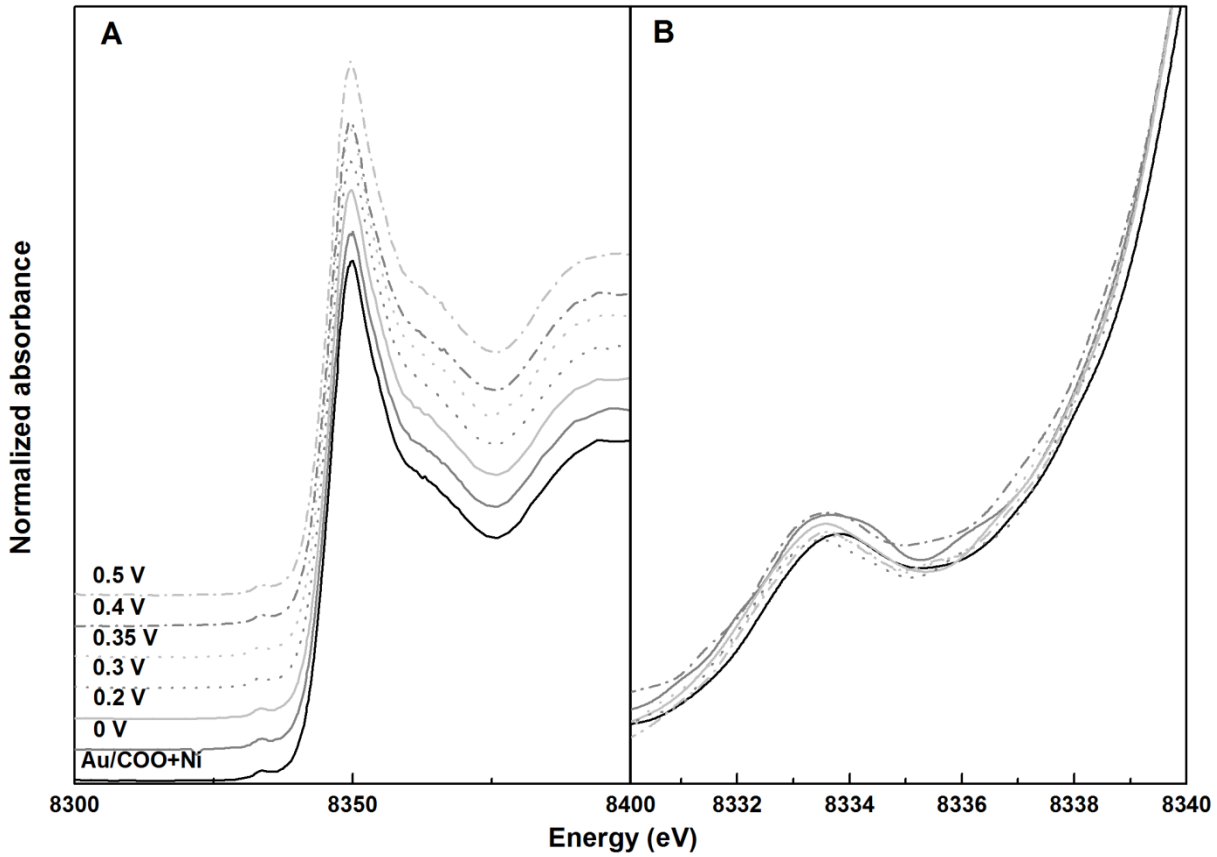

Figure S5: A: XANES spectra of the Ni(II) surface complexes on gold substrate at different applied potentials (vs. $Ag/AgCl/KCl_{sat}$). B: Pre-edge peak of the spectra shown in S5-A.