Supplementary Materials

Gold surface cleaning by etching polishing: optimization of polycrystalline film topography and surface functionality for biosensing

Borys Snopok[1,2,3,*], Arwa Laroussi[2,5], Clodomiro Cafolla[4], Kislon Voïtchovsky[3,4], Tetyana Snopok[1], Vladimir M.Mirsky[2]

[1] V. Lashkaryov Institute of semiconductor physics, NAS of Ukraine, Kyiv, Ukraine
[2] Nanobiotechnology - Institute of Biotechnology, Brandenburg Technical University, Cottbus-Senftenberg, Germany
[3] Durham University, Institute of Advanced Study, Durham DH1 3LE, UK
[4] Durham University, Physics Department, Durham DH1 3LE, UK
[5] University of Tunis El- Manar, Faculty of Science of Tunis, Chemistry Department, Laboratory of Analytical Chemistry and Electrochemistry (LR99ES15), 2092 Tunis El-Manar, Tunisia

*corresponding author, email: snopok@isp.kiev.ua

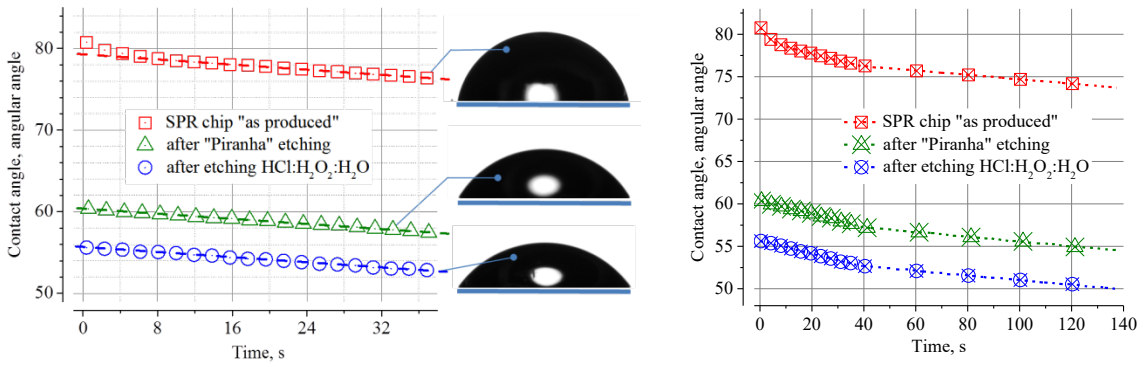


Fig.S1. a) Initial part of the dependence of the static contact angle on time for gold films after cleaning and etching at room temperature. The images of a 5-μL water drop on the surface were captured from a typical SPR chip “as produced” (top), after the solvent rinse and “Piranha” etching (40 s) and after the treatment with a freshly prepared 3% HAHP composition for 15 minutes (bottom). b) Long time dependence of the static contact angle on time for gold films after cleaning and etching at room temperature.

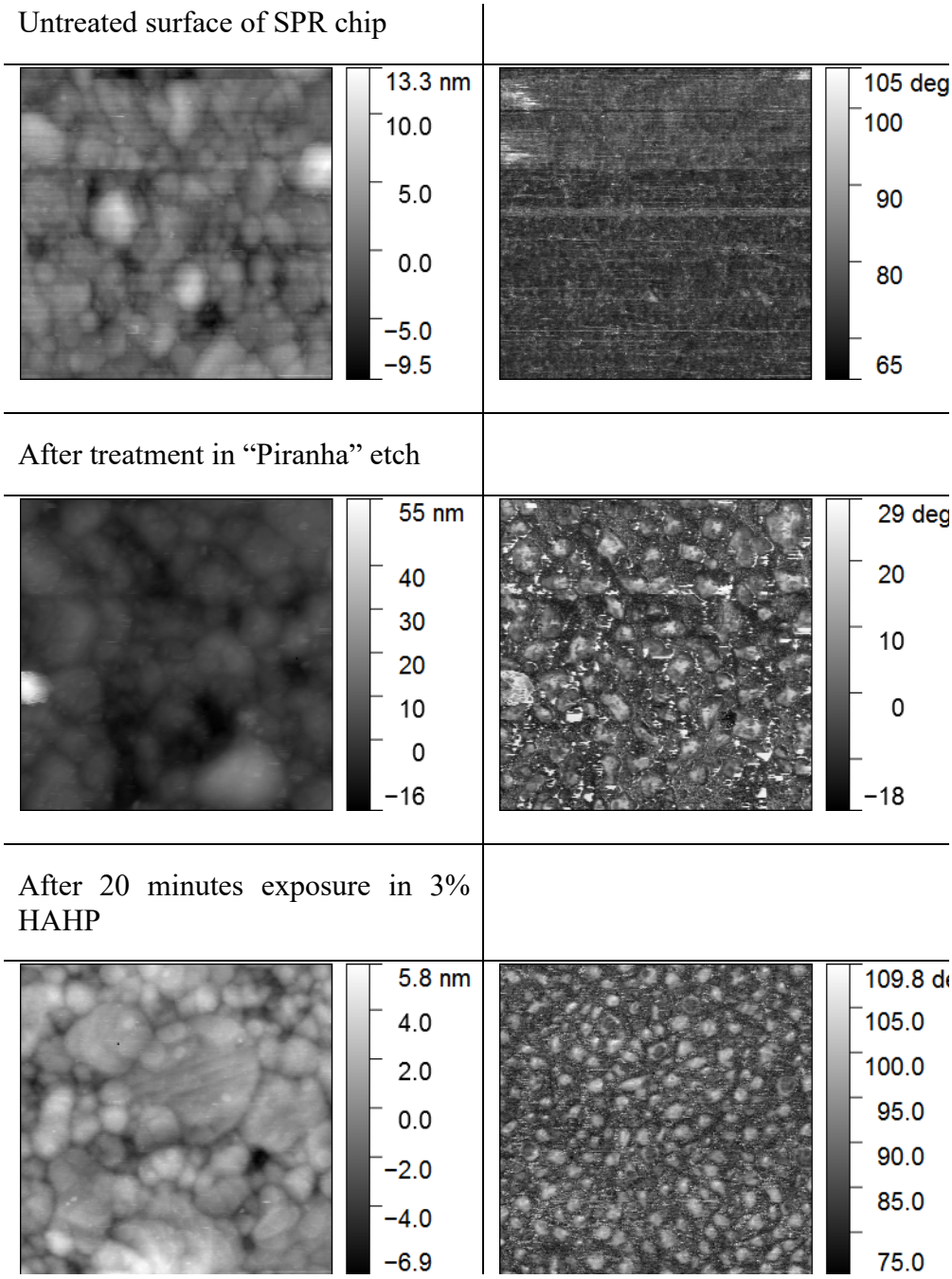
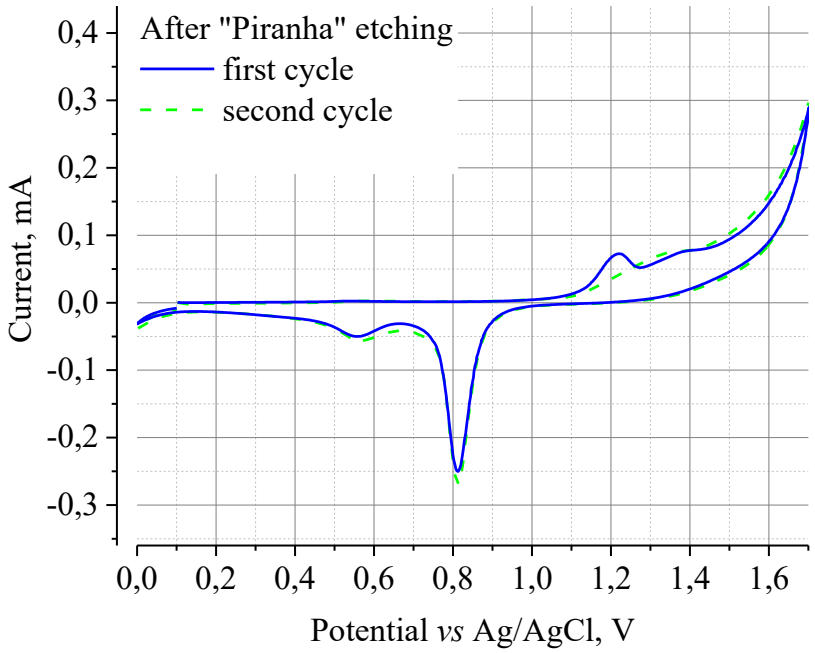
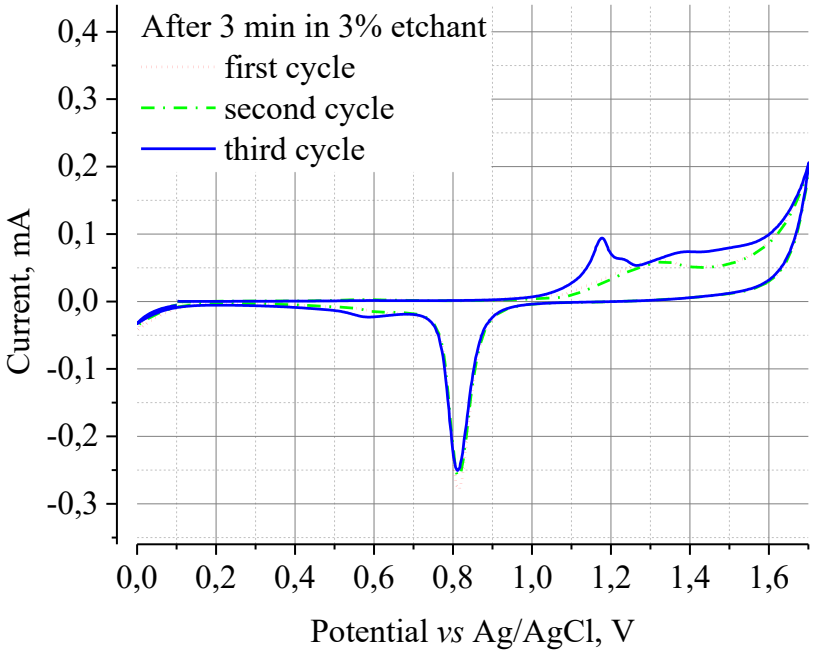
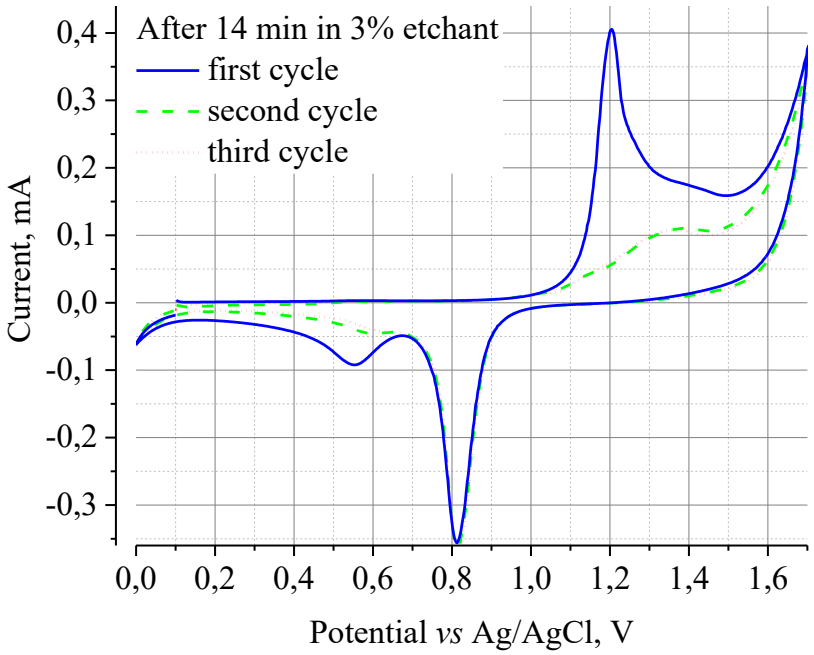


Fig.S2. An atomic force microscope image (1000 nm square scan) of a gold surface: untreated (top), treated by “Piranha” for 40 s (middle) (b) and by 3% HAHP for 20 min (bottom). The phase image (right) reveals features not visible in the topography (left) due to local variations in the surface hydration structure.


After "Piranha" etching
first cycle
second cycle
Current, mA
0,4
0,3
0,2
0,1
0,0
-0,1
-0,2
-0,3
0,0
0,2
0,4
0,6
0,8
1,0
1,2
1,4
1,6
Potential *vs* Ag/AgCl, V


After 3 min in 3% etchant
first cycle
second cycle
third cycle
Current, mA
0,4
0,3
0,2
0,1
0,0
-0,1
-0,2
-0,3
0,0
0,2
0,4
0,6
0,8
1,0
1,2
1,4
1,6
Potential *vs* Ag/AgCl, V



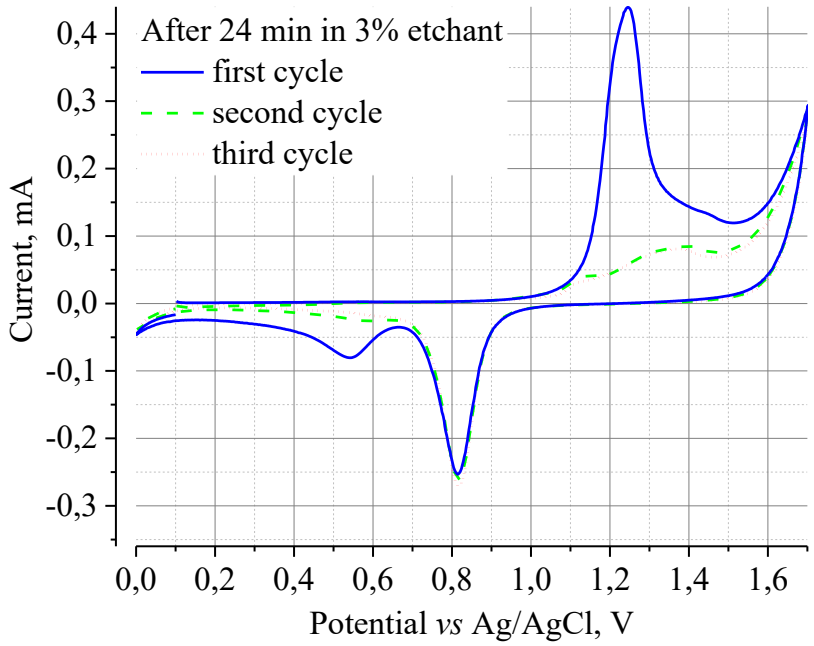


Fig.S3. A typical cyclic voltammogram (0.0 to 1.7 V, 50 mV/s) recorded for a polycrystalline gold electrode in 0.05 M H_2S0_4 at 25°C in a conventional three-electrode cell setup, for different etching times in 3% HAHP etchant solution in water.

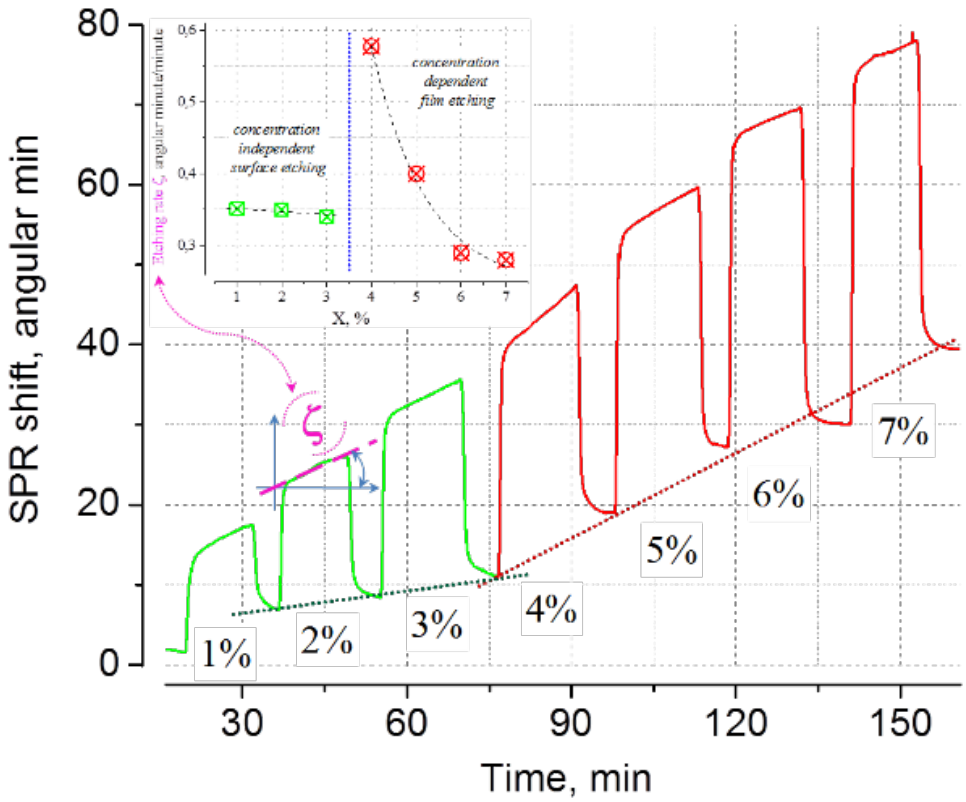


Fig.S4. Kinetics of SPR angle during etching of the gold films by subsequent pulses etching solutions of different concentrations alternating with distilled water of the HAHP etching solution with concentration of active component x=3%.

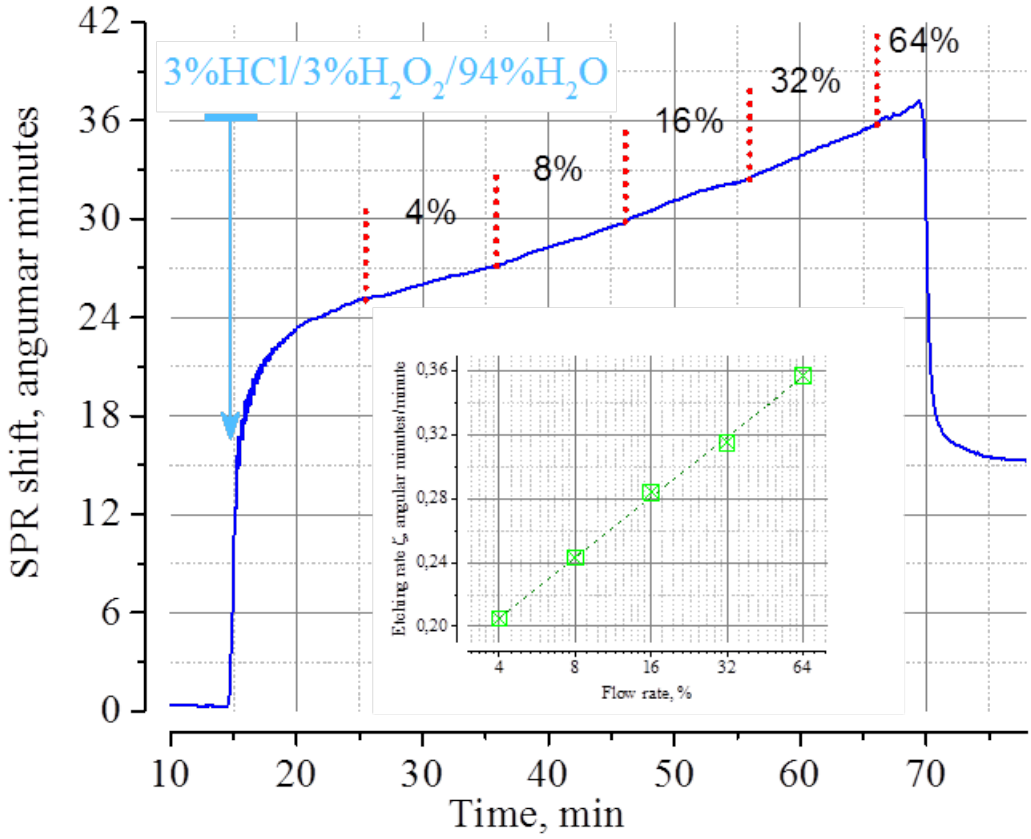


Fig.S5. Kinetics of SPR angle during etching of the gold films on the flow rate of the HAHP etching solution with concentration of active component x=3%.