Supporting Information

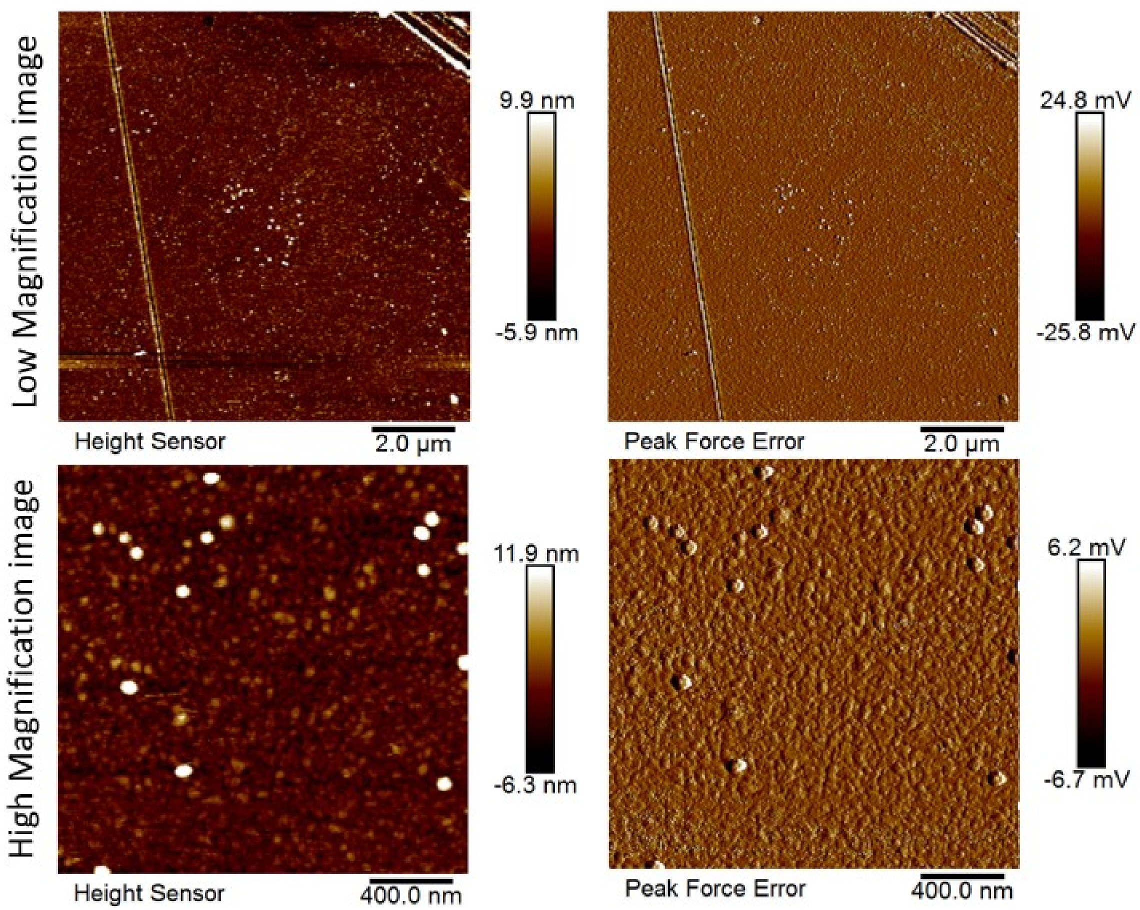
Continuous Molecular Monitoring of Human Dermal Interstitial Fluid with Microneedle-Enabled Electrochemical Aptamer Sensors.

Mark Friedel,*[a] Benjamin Werbovetz, [a] Amy Drexelius,[a] Zachary Watkins[a], Ahilya Bali[a], Kevin W. Plaxco[b], and Jason Heikenfeld[a]

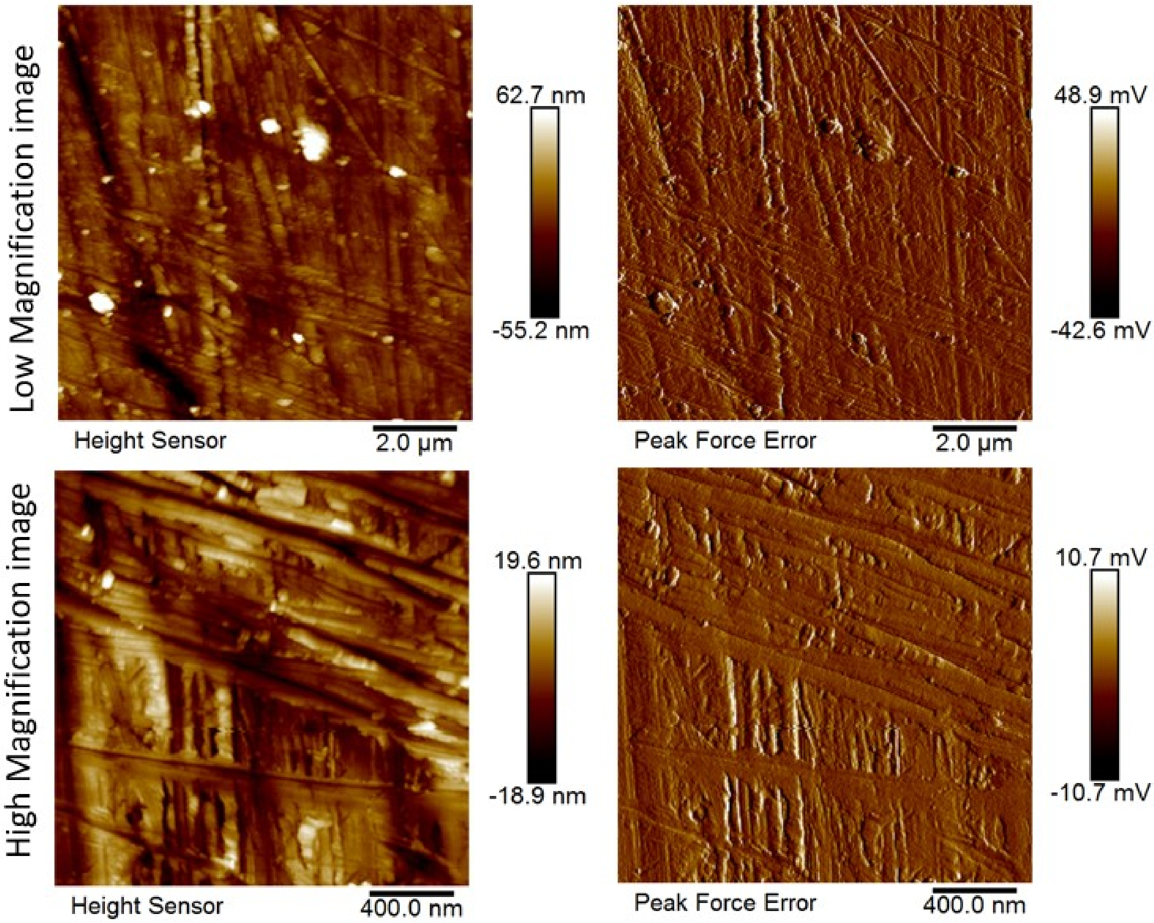
[a.] *Novel Devices Laboratory, College of Engineering, University of Cincinnati, Cincinnati, Ohio 45221, USA*
[b.] *Department of Chemistry and Biochemistry, University of California, Santa Barbara, Santa Barbara, CA 93106*

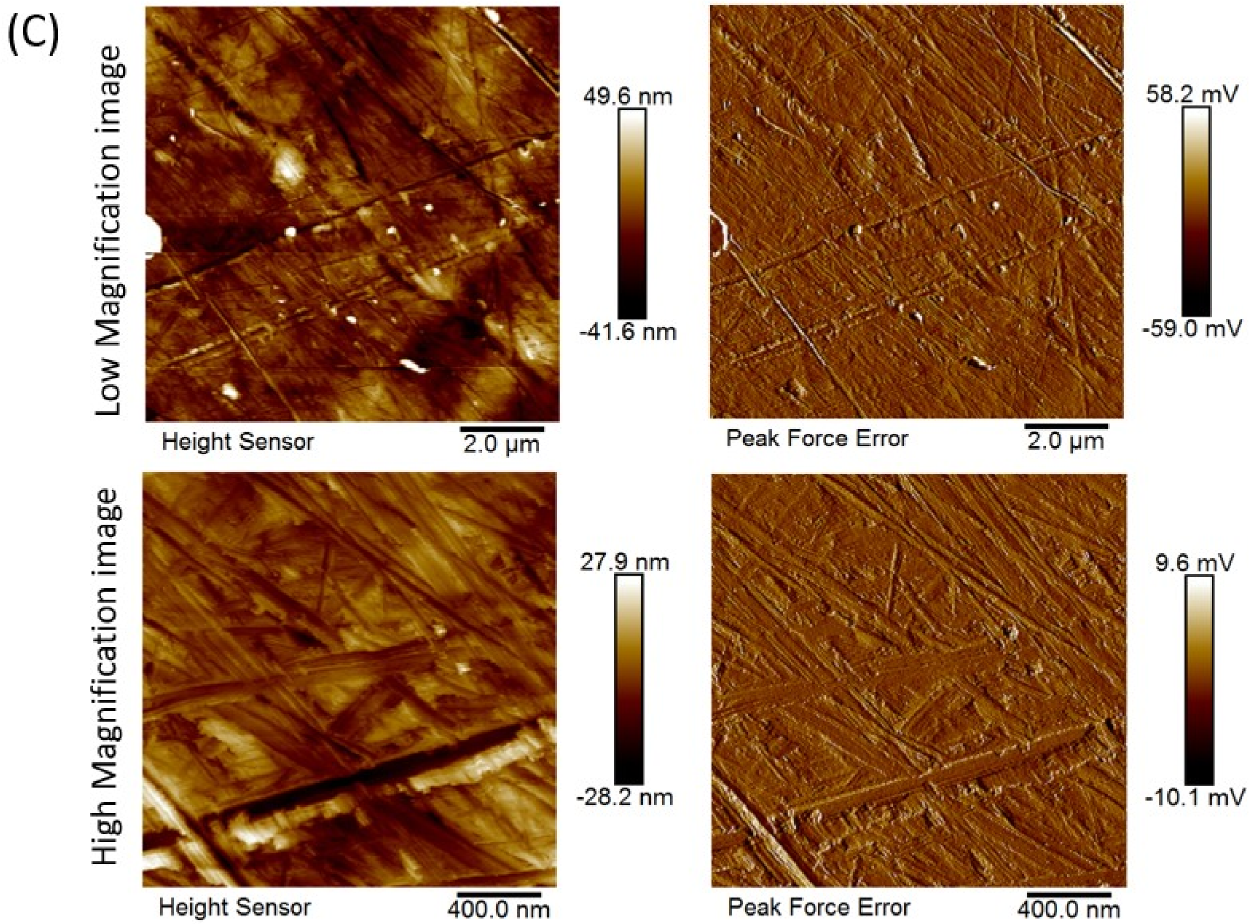
Contents:

(A)

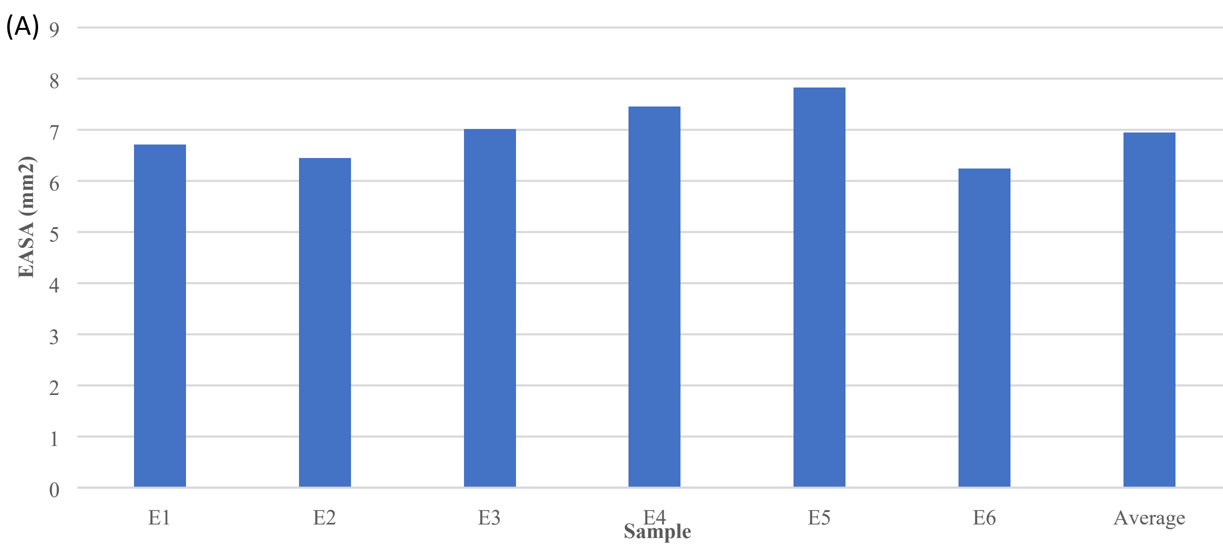

Low Magnification image
9.9 nm
-5.9 nm
Height Sensor
2.0 µm
24.8 mV
-25.8 mV
Peak Force Error
2.0 µm
High Magnification image
11.9 nm
-6.3 nm
Height Sensor
400.0 nm
6.2 mV
-6.7 mV
Peak Force Error
400.0 nm

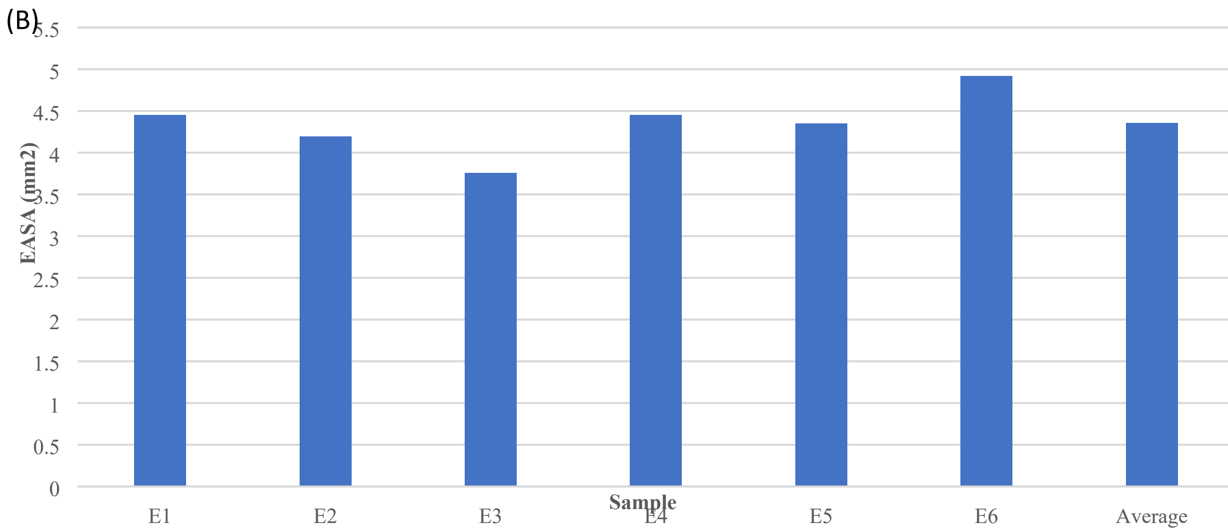
(B)


Low Magnification image
High Magnification image
62.7 nm
-55.2 nm
Height Sensor
2.0 µm
48.9 mV
-42.6 mV
Peak Force Error
2.0 µm
19.6 nm
-18.9 nm
Height Sensor
400.0 nm
10.7 mV
-10.7 mV
Peak Force Error
400.0 nm

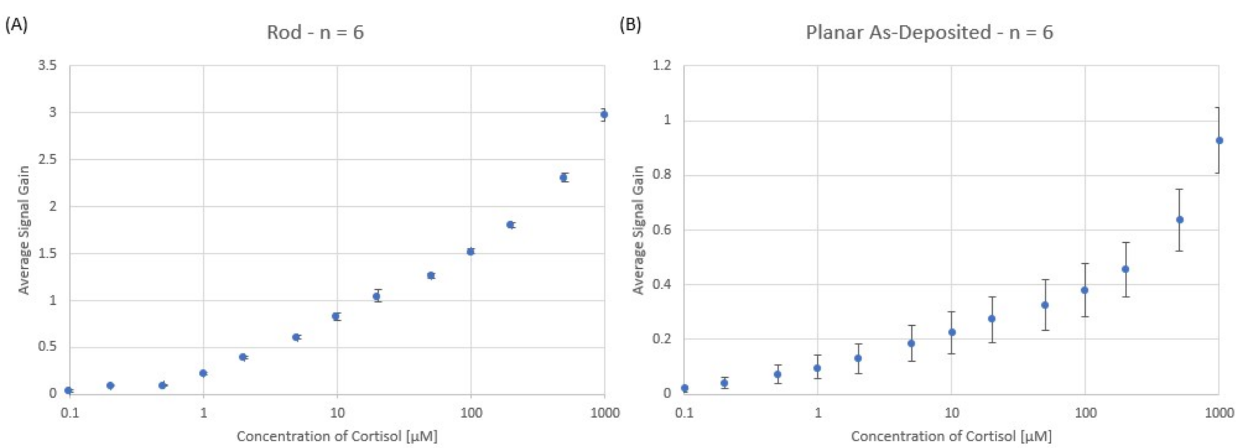


SI Figure 1 – Atomic Force Microscopy images show thin film gold as deposited in image (A) and after 30 seconds (B) and 60 seconds (C) mechanical polish. As deposited sensors exhibited root mean square surface roughness values of 0.61nm with 30 and 60 second polished sensors exhibiting higher values of 5.80 nm and 6.73 nm respectively.

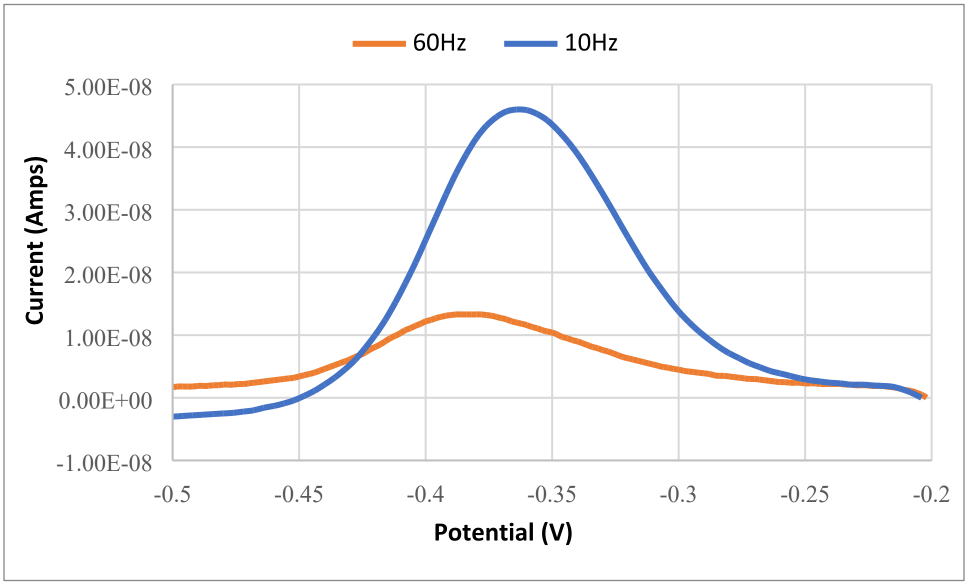




SI Figure 2 – Comparison of electrochemically active surface area of disc (A) and thin-film (B) gold electrodes electrochemically active surface area. Collected in 0.5M H2SO4 using cyclic voltammetry data reported in text is 1-(mean planar EASA/mean disc EASA) ±percent standard deviation of the ratio of these means. Thus, the planar electrodes have 38.3%±1.22% less active surface area than disc electrodes.



SI Figure 3 – Plots of signal gain with the addition of target for cortisol sensors tested on disc (A) and as deposited thin-film (B) electrode surfaces. Signal gains reported as ratios.



SI Figure 4 – Square wave voltammograms comparing redox current attained for on-body electrodes at 60Hz and 10Hz. Currents were adjusted for comparison by subtracting the first current value collected at -0.2V from all datapoints.