Supporting Information

to the manuscript

Quantitative Characterization of Nanoadhesion by Dynamic Force Spectroscopy

by

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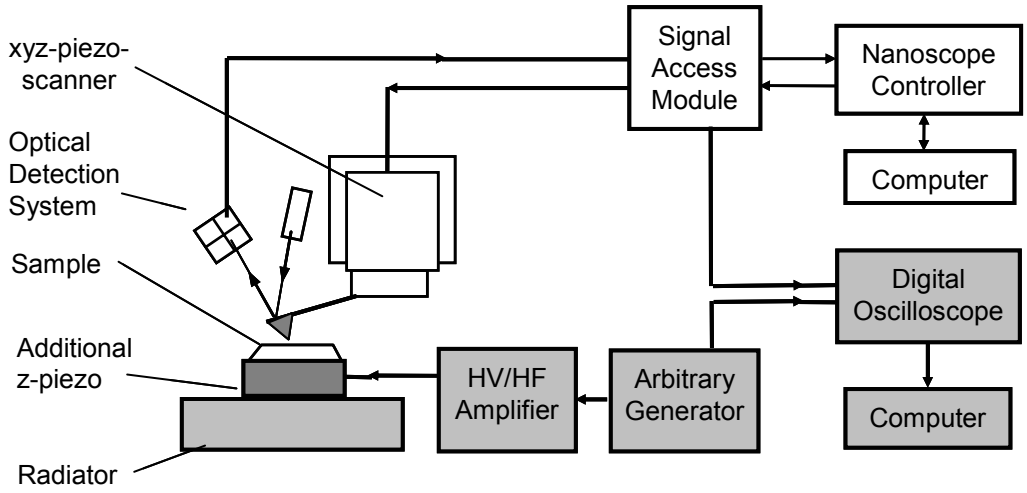

Figure S1. Schematic of the modified AFM. Gray color indicates added devices.[1]

The additional piezo actuator (model PL055.21, PI Ceramic, Germany; resonant frequency > 300 kHz, actuation range 1 μm) overcomes the limited resonance frequency of the xyz-piezo-scanners of commercial AFM systems that leads to strong distortions of the piezo movements

already at a frequency of 200 Hz. The additional piezo is mounted on a radiator (Figure S1) to be cooled during operation. Practically, the frequency of ramping the piezo up and down is limited by the mechanical properties of available AFM cantilevers.

A key component of the system is the high voltage / high frequency amplifier to drive the piezo actuator. Its output signal at frequencies of 10 – 50 kHz must have high enough amplitudes (30 - 80 V) to ensure a sufficient ramp size of piezo movement. Otherwise, the force induced by the bending of the AFM cantilever would not be sufficient to separate the AFM tip from the surface. Such an amplifier, based on an MP38 operational amplifier (APEX Microtechnology Co., USA), was home made.

[1] More information can be found in the paper:

Ptak, A.; Kappl, M.; Butt, H.-J., Modified atomic force microscope for high-rate dynamic force spectroscopy, *Appl. Phys. Lett.* **2006**, *88*, 263109.