

Dynamic Force Spectroscopy in Vacuum, Air, and Liquids Using the Constant Excitation Mode

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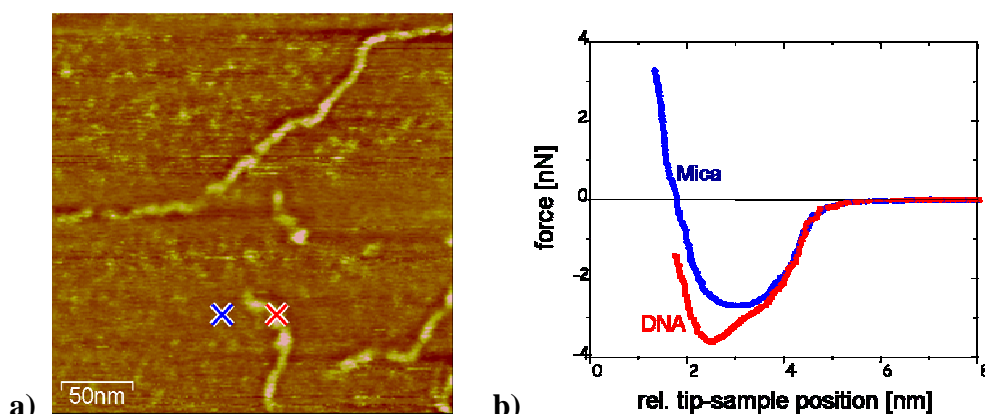
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Dynamic force spectroscopy (DFS) enables the precise detection of tip-sample interaction forces with a “jump-to-contact”. However, its application was limited to samples suitable for vacuum conditions for a long time. This was a serious draw-back for biological samples. Consequently, it is of great interest to utilize dynamic force spectroscopy also in ambient conditions and liquids in order to enlarge the field of applications

In a theoretical work [1] we recently suggested to utilize the so-called constant-excitation mode (CE-mode) to solve this problem. Originally, the CE-mode was applied in vacuum, but it works also in air and liquids. Here we present experimental applications of our approach to measure the tip-sample forces continuously without instabilities in vacuum [2], ambient conditions [3] and liquids.

As an example for such an experiment the topography of DNA adsorbed on a Mica substrate is shown in **a**). The experiment was done under ambient conditions. Frequency shift vs. distance curves were recorded at the marked positions. The measurement of tip-sample interaction using the method described in [1-3] reveals different force curves on the DNA and the Mica substrate as shown in **b**).



- [1] H. Hölscher, B. Gotsmann, A. Schirmeisen, *Phys. Rev. B.* **68**, 153401 (2003).
- [2] A. Schirmeisen, H. Hölscher, B. Anczykowski, D. Weiner, M. M. Schäfer, and H. Fuchs, *Nanotechnology* **16**, S13 (2005).
- [3] H. Hölscher and B. Anczykowski, *Surf. Sci.* **579**, 21 (2005).