

Examination of Force curve between the Tip and the Substrate for Non-Contact AFM Imaging of Bio-sample

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There have been considerable interests about the sub-nanoscale resolution of biomolecule AFM imaging. Optimization of sample preparation and imaging conditions of soft biological structures provide possibilities to control the tip-sample interactions. In order to achieve nanoscale resolution, stable sample conditions become necessary for both hydrophilic and hydrophobic surface. [1,2]

The silicon substrates were treated by 48% hydrofluoric acid (HF) solution, and by aminopropyltriethoxysilane (APTES) solution, and by degreasing only. After sample treatment procedures, the force-distance measurements were carried out immediately. The sample with a 48% HF solution treatment exhibits greater adhesion force than the surface treated with APTES. The noncontact imaging with Si tip of DNA samples was performed with ~40 nm driving amplitude of the cantilever with spring constant 42 N/m and resonant frequency 320 kHz. The tip-sample distance was set to 40 – 50 nm. The sample was treated with APTES solution for immobilization of the DNA sample [Fig.1] The imaging using hydrophobic carbon tip will also be performed.

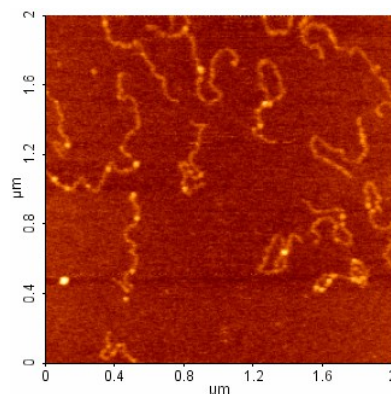


Fig.1. DNA image using noncontact mode with tip-sample distance of ~40 nm. The spring constant and resonant frequency was 40N/m and 320 kHz.

[1] D.J. Mueller, M. Amrein, A. Engel, *J. Struct. Biol.*, **119**(1997) 172.

[2] A.L. Weisenborn, P. Maivald, H.J. Butt, P.K. Hansma, *Phys.Rev. B.* **45** (1992) 11226.