NANONIS APPLICATION NOTE

ATOM TRACKING USED FOR REPRODUCIBLE FORCE SPECTROSCOPY

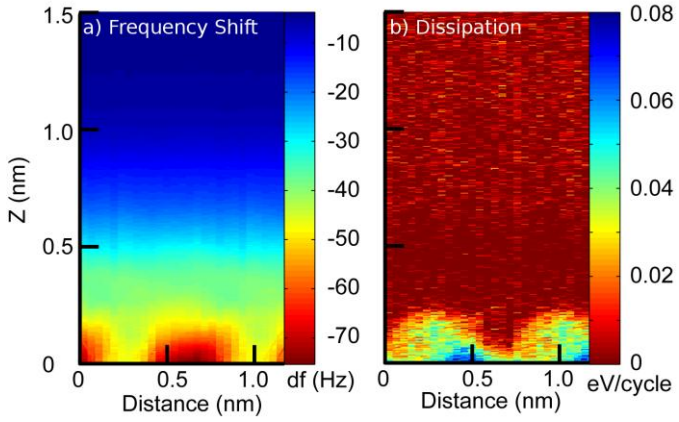
Force spectroscopy in dynamic force microscopy at room temperature is a challenging feat due to the unavoidable thermal drift. Especially in three dimensional force spectroscopy, even a tiny drift of around 10 pm over the measurement will result in a crucial error.

In our measurement on KBr(001), we perfectly measure the thermal drift with the Atom Tracking Module and automatically compensate for it. This lets us reproducibly acquire multiple force spectroscopy curves.

The spectra below show the force spectroscopy curves taken along the black line in the scan on the right. The line is conveniently defined in the grid spectroscopy module with force spectroscopy chosen as experiment to be run along the line.

Before starting the measurement, the thermal drift of the x, y, and z is measured with the atom tracking module and automatically compensated. Then a series of z-sweeps is acquired recording frequency shift and dissipation versus Z along the line. The result is shown in the figure below. One measurement usually takes a few minutes.

A second scan after acquiring the spectra confirms that the drift has been accurately measured and predicted, i.e. the two scans lie perfectly on top of each other.



a) Frequency shift and b) Dissipation acquired along the line indicated in the scan on the right hand side.

Reference:

[1] M. Abe et al., *Room-temperature reproducible spatial force spectroscopy using atom-tracking technique,* Appl. Phys. Lett. **87**, 173503 (2005)

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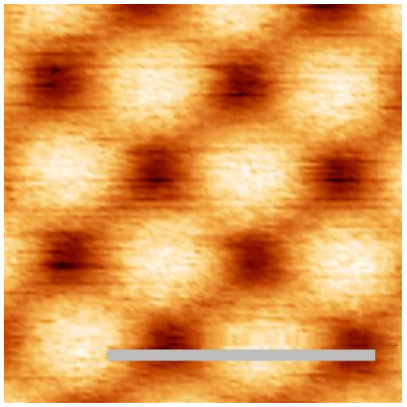

Atomically resolved KBr(001), acquired in FM-AFM mode. The spectra are taken along the black line in the image.

Nanonis Modules in Use:

- Base Package BP4
- Dual-OC4
- Atom Tracking Module
- Grid Spectroscopy Module

System:

- Home-built RT-AFM
- Home-built HV amplifier

NANONIS
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