Contrast Formation in NC-AFM

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When imaging surfaces and molecules on surfaces with AFM sooner or later the question is asked: What do I see? A. Foster stated correctly: "Experimental interpretation of NC-AFM images is often based on the initial assumption that molecules are imaged as bright. But there is no guarantee that they are imaged as bright." [1] A good example for this is shown in Fig. 1. Here, the same molecule shows completely different contrasts, depending on the measurement conditions. [2, 3] With this ambiguity it is necessary to take a closer look at the principles of contrast formation.

My talk will be a detailed analysis of the four typically measured NC-AFM signals, i.e., detuning, topography, dissipation and amplitude. Contrast formation within these channels will be discussed as well as pitfalls and principal limitations in qualitative and quantitative data analysis. Topics will include:

- Contrast: corrugation vs. sensitivity.
- Repulsive interaction and contrast inversion.
- The apparent height problem.
- Constant height and constant detuning.

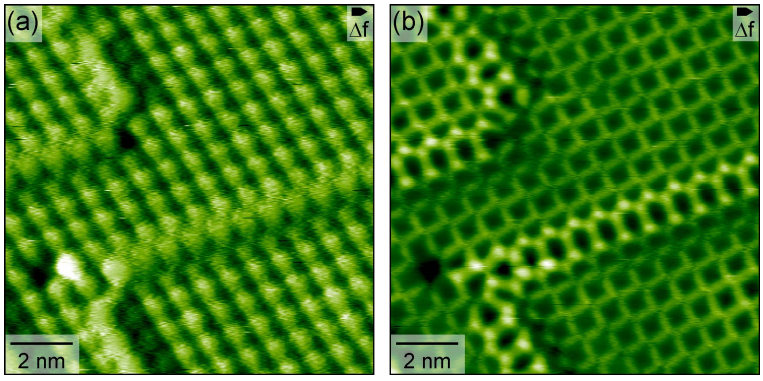

Figure 1: An island of C_{60} fullerenes, recorded with low (a) and high (b) detuning set point revealing contrast inversion. [3]

References

[1] A. Foster et al., *J. Phys. Chem. B* **109** (2005) 4554.
[2] P. Rahe et al., *Phys Rev B* **77** (2008) 195410.
[3] F. Loske et al., *Nanotechnology* **20** (2009) 264010.