NC-AFM imaging of metal oxide surfaces

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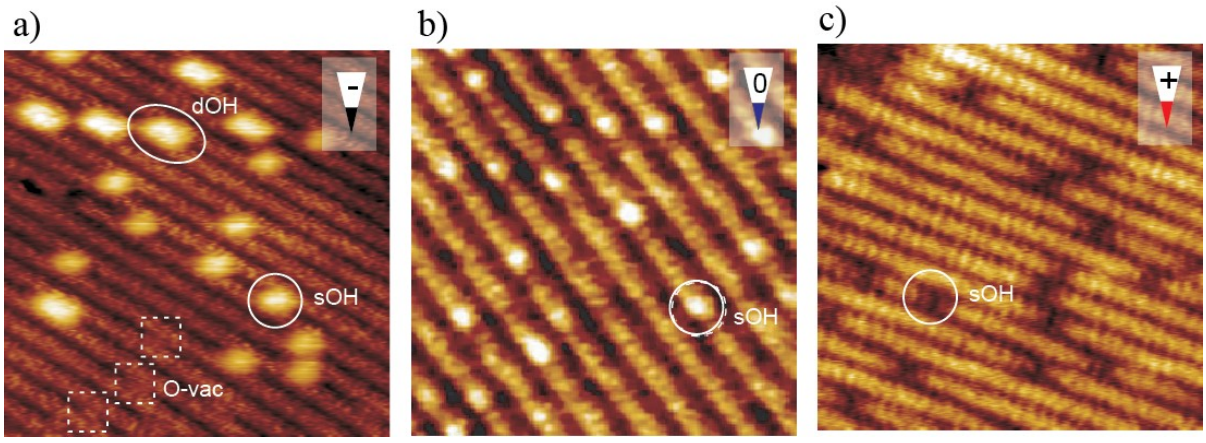
In materials science and technology, many insulating oxides play an essential role. NC-AFM is so far one of the only techniques with the ability to address their atomic-scale surface structure. A distinct advantage of NC-AFM imaging is for example the access to defects and single adsorbates on such surfaces. One such application of NC-AFM is in fundamental studies of heterogeneous catalysis. A heterogeneous catalyst typically consist of an active metal nanoparticles dispersed on a high-surface are oxide support. The role of oxide supports has often been seen as structural stabilizer of the metal nanoparticles, but we now know that the situation is often much more complex. Nevertheless, not much is understood for such systems, which motivates the use of NC-AFM provide information on the properties of the clean oxide surfaces and their interaction with metals and adsorbates.

Against this background I will in my lecture present NC-AFM studies of important insulating or poorly conducting oxide surfaces [1,2]. I will discuss the general challenges associated with the preparation and imaging of oxides. I will also show how subtle NC-AFM contrast variations due to AFM tip termination can be give rise to widely different images of TiO_2 surfaces, and how such information can be used to analyse atomic defects in the surface region. In extension of this, I will then show how mapping of oxide surfaces in different contrast modes could be used to determine the surface structure of the "spinel" $MgAl_2O_4(001)$ surface and its prevalent surface defects. In this connection, I will also discuss the concept of polar oxide surfaces [3].



Literature:
[1] Lauritsen JV, Reichling M. Atomic resolution non-contact atomic force microscopy of clean metal oxide surfaces. *J. Phys. Cond. Matt.* 2010, **22:** 263001.
[2] Lauritsen JV. Defects at Oxide Surfaces Noncontact AFM Imaging of Atomic Defects on the Rutile TiO_2(110) Surface. *Springer Series in Surface Sciences (Eds. G. Thornton, J. Jupille)* 2015, **58:** 241-272.
[3] Goniakowski J, Finocchi F, Noguera C. Polarity of oxide surfaces and nanostructures. *Rep. Prog. Phys.* 2008, **71:** 016501.