Seminář odd. 26
Tenkých vrstev a nanostruktur

Fyzikální ústav AVČR, Cukrovarnická 10, Praha 6

datum: 6. 10. 2015 úterý
čas: 10:00
místnost: knihovna, budova A, 1.p.

TÉMA

From structural to charge stability: Molecules on the insulating calcite (10$\bar{1}$4) surface

Philipp Rahe

School of Physics and Astronomy, The University of Nottingham (UK)
philipp.rahe@nottingham.ac.uk

Electron transfer in molecular systems is not only a ubiquitous and vital process [1], but forms the fundamental principle for many concepts of electronics at the molecular level [2]. In order to stabilise charges within single molecules or small molecular ensembles on surfaces, the usage of an insulating support enables electronic decoupling to preserve the inherent molecular functionality and furthermore blocks an immediate charge neutralisation due to electrical shorting. Non-contact atomic force microscopy (NC-AFM) is one of the few surface science techniques able to image these truly insulating systems at the (sub-) molecular level, to map charge states and to perform local manipulations.

The calcite (10$\bar{1}$4) surface, a material itself highly relevant in biology and materials science, has very recently proven as a most promising substrate for studying molecular self-assembly [3] and examples of self-assembled molecular structures will be presented. The strategy of anchoring small molecules to this surface allows advanced experiments at room or even elevated temperatures, such as the herein presented covalently bonded structures created from the thermal activation of halogenated molecules in an on-surface synthesis step [4]. Last, I will present results for a metallocene/calcite system, where localized charge state modification of the molecule-on-calcite system using the tip of an atomic force microscope was possible at room temperature [5]. The ionised states are stable and can be investigated using Kelvin Probe Force Microscopy (KPFM). A model for the KPFM contrast formation for charged systems will be presented in this context [6].

[1] P.F. Barbara et al., J. Phys. Chem. 100, 13148 (1996).
[2] J.R. Heath, Annu. Rev. Mater. Res. 39, 1 (2009).
[3] P. Rahe et al., Adv. Mater. 25, 3948 (2013);
P. Rahe et al., small 19, 2969 (2012);
P. Rahe et al., Phys. Chem. Chem. Phys 14, 6544 (2012).
[4] M. Kittelmann et al., ACS Nano 7, 5614 (2013).
[5] P. Rahe et al., submitted (2015).
[6] J. Neff, P. Rahe, Phys. Rev. B 91, 085424 (2015).

odborný garant: *Ing. Pavel Jelínek, PhD.*