What can we learn from high-resolution AFM/STM images: mapping molecular electrostatic potential

Pavel Jelinek[1]
[1]*Nanosurf Lab, Institute of Physics of the AS CR, Cukrovarnicka 10, Prague 6, CZ-162 00, Czech Republic*

email: jelinekp@fzu.cz

High-resolution AFM images of single molecules [1] allows bond-order discrimination [2] or identification of a priory unknown molecules [3]. The origin of the high-resolution AFM contrast is caused by bending of functionalized probe due to tip-sample interaction [2,4]. The bending is mainly driven by van der Waals (vdW) and Pauli repulsion. Recently, we noticed that the electrostatic interaction acting between the probe and the inspected molecule could significantly modify the submolecular contrast [5]. Here we present a new experimental protocol, which provides straightforward way to resolve the local electrostatic field of a single molecule by means of AFM with functionalized tips with unprecedented resolution. We show that difference between two high-resolution images acquired at different conditions contains information about the local electrostatic field. Application of elastic deformation technique provides deformation vector field, which can be converted into the local electrostatic field.

References:

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