Adsorption of organic molecules on TiO2(110)-1x2 surface: formation of the interface

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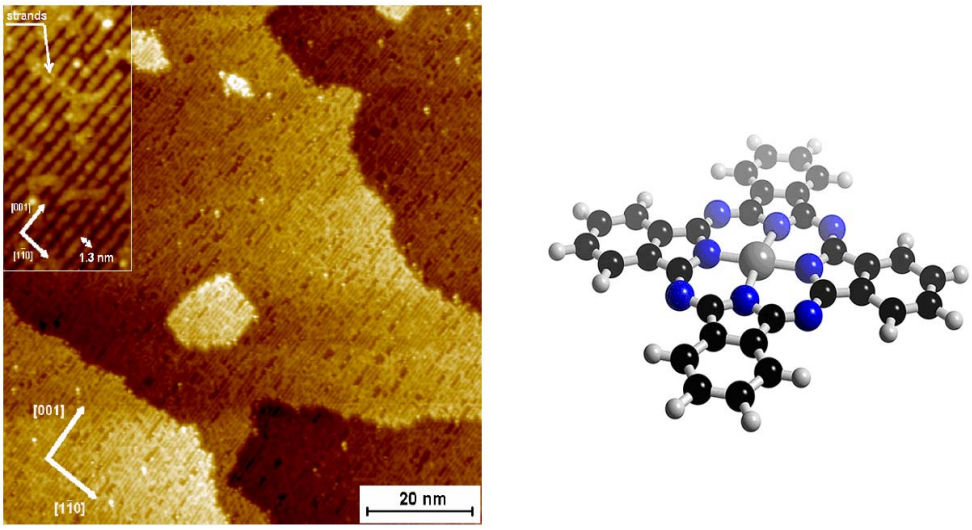
Time: Twice a week.

Introduction: The organic molecules are found to be used in many areas of industry like catalysis, pigments, sensors etc. Their practical application is closely related to the underlying unique structures these molecules form with inorganic surfaces. Consequently, the properties of the organic nanostructures formed on solid substrates becomes important not only from the point of view fundamental science but also from the point of view of technology. However, it is not so easy to prepare self-assembled structures of organic molecules onto metal oxides, such as single-crystal TiO_2 substrate. Despite this surface is relatively well studied there is a lack of data concerning the adsorption geometry and adsorption sites of molecules, no information about the charge transfer at the interface and the interface itself is poorly studied on an atomic level although it has great potential use in nanotechnology. All these could be good reasons to initiate the study of organic molecules on rutile 110 plane. So, for this propose STM observations on atomic scale and at low coverage are of particular interest in contrast with the spatial and temporal averaging of many convenient analytical methods**.**



STM image of TiO2 (110) – 1x2 reconstructed surface taken at room temperature (left). Sketch of metal phthalocyanine molecule (right).

Aim: Variable Temperature Scanning Tunneling Microscopy will be employed to study the early stages of adsorption of organic molecules onto 1x2 surface reconstruction of TiO2 (110). Interaction of single molecules and molecular clusters with the substrate will be investigated on an atomic level to find the conditions of the formation of stable surface objects or layers. Scanning Tunneling Spectroscopy will be applied to study local electronic properties of the objects as a function of their chemical state.

Work program:

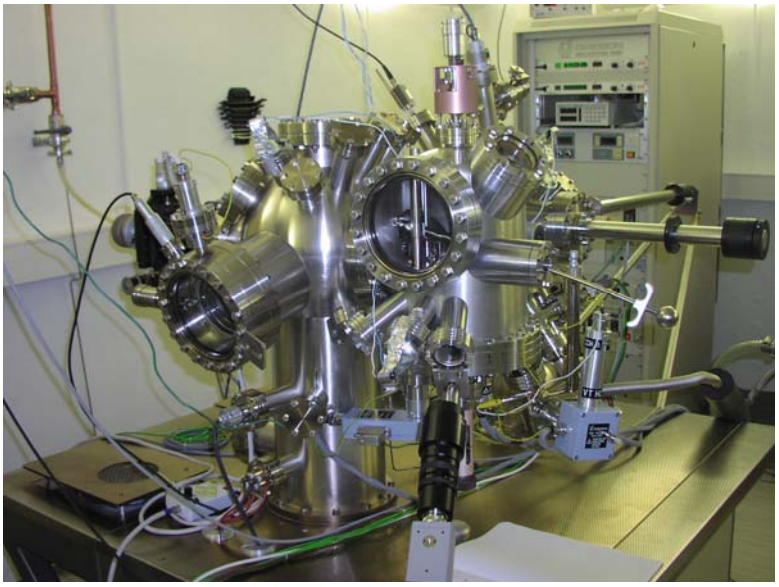
1. *In situ* preparation of TiO2 (110)-1x2 reconstructed surface by the cycles Ar+ bombardment and by UHV annealing 1000 K.
2. Deposition and following investigation of organic molecules on this surface by means of STM\STS at room and low temperature.

*Keywords***:** Titanium dioxide, Molecular adsorption, Scanning Tunneling Microscopy, Scanning Tunneling Spectroscopy, Low dimensional structure; Organic molecular engineering.

Literature:

[1] C. L. Pang et. al., Nanotechnology 17 (2006) 5397–5405.
[2] D. Ino et. al., J. Phys. Chem. B 2005, 109, 18018-18024
[3] U. Diebold et. al., Surface Science Reports 48 (2003) 53-229

Equipment:



Variable Temperature UHV STM, Omicron GmbH, Germany.