Low-Temperature STM Study of the (\(\sqrt{3} \times \sqrt{3}\))30° Reconstructed Ni\(_2\)P (0001) Surface - Atomic Resolution and Geometric Model - GEORG HERMANN SIME2, THOMAS KONGS3, MARKUS HEYDE1, HANS-JOACHIM FREUND1, KUMIKO KINOSHITA2, YUTA NAKAGAWA2, SHUSHI SUZUKI2, and KIYOTAKA ASAKURA2 —

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New catalysts have to be found to follow the demanding legislation around the world for the reduction of sulfur contents in transportation fuels. A promising candidate is Ni\(_2\)P [1], which is fairly new to surface science. Despite several wet-chemical studies, simulation, spectroscopic and the first room-temperature STM characterization [2] there are many open questions to this material. In surface studies (0001) oriented single crystals have been analyzed so far. In our ultra-high vacuum low-temperature STM study we worked on a deeper understanding of the surface termination, its preparation and microstructure. We present atomically resolved images of a previously unreported (\(\sqrt{3} \times \sqrt{3}\))30° reconstruction of the (0001) surface. We put forward considerations for a geometrical model that is being developed in our cooperation based on the Ni\(_2\)P termination of Ni\(_2\)P (0001).

Determination of the strength of adsorbate-surface interaction is an important fundamental issue in surface science and an essential prerequisite for understanding real catalytic processes. The strength of adsorbate-surface bonding and of lateral, adsorbate-adsorbate interactions can be addressed by measurement of heats of adsorption as a function of surface structure, coverage and presence of other co-adsorbates.

Traditional experimental techniques for probing the energetics of adsorption, such as e.g. thermal desorption spectroscopy, provide reliable results only for reversible adsorption systems and cannot be correctly applied for processes including dissociation, clustering, diffusion into the bulk or reaction with other coadsorbates. These restrictions can be overcome by using a direct calorimetric measurement of adsorption energies on surfaces. For this purpose we set up a new microcalorimetry experiment at Fritz-Haber-Institut, which is based on a method previously developed by King and Campbell [1]. The method relies on the measurement of a temperature change upon adsorption of gaseous molecules on ultrathin (1–10 μm) single crystals, which is realized by application of a pyroelectric detector and an independent laser-based energy calibration.


O 36.10 Tue 16:30 MA 041 Photoemission experiments using soft x-ray standing waves — ∙Sven Döring1,2, Daniel Weiher1,2, Ulf Berges1,2, Charles S. Fadley3,4,5, and Carsten Westphal1,2 — ∙DELTa, TU Dortmund, Maria-Goeppert-Mayer-Str. 2, 44221 Dortmund, Germany — ∙Experimentelle Physik 4, TU Dortmund, Otto-Hahn-Str. 4, 44221 Dortmund, Germany — ∙Materials and Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA — ∙University of California, Davis, CA 95616, USA — ∙Forschungszentrum Jülich, IFZ-9, 52425 Jülich, Germany

A high depth resolution can be obtained by creating a soft x-ray standing wave field on the sample surface and performing photoemission experiments in this field. A high reflectivity is necessary for a sufficient standing wave modulation. Multilayer samples are used which provide a strong first order Bragg reflection. The standing wave field can be moved through the sample surface by a sample rotation around the Bragg angle. The shape and modulation of these rocking curves contain information about the sample. First measurements on various samples were performed at the TU Dortmund’s synchrotron light source DELTA and at higher energies at BESSY II in Berlin. Results from different samples will be presented in the talk: rocking curves from bare multilayers will be shown as well as a first test measurement of a thin layer of MgO on a wedge of Fe on top of a multilayer. The data show depth profiles obtained of the internal interface. Different chemical states of the same element can be identified by their chemical shift in the XPS spectrum and allocated to certain layers.