O 14 Struktur und Dynamik reiner Oberflächen

Zeit: Freitag 15:45–16:45 Raum: TU EB407

O 14.1 Fr 15:45 TU EB407

Time-resolved low energy electron diffraction from large molecules on surfaces — •Claudio Cirelli[1,2], Matthias Hengsberger[1], Andrei Dolocan[1], Hansjörg Neff[1], Jürg Osterwalder[1], Herbert Over[2], and Thomas Greber[1] — [1]Physik-Institut, Universität Zürich, CH-8057, Switzerland — [2]Physikalisch-Chemisches Institut, Justus-Liebig-Universität, Heinrich-Buff-Ring 58, D-35392 Gießen, Germany

In order to observe dynamics of molecules adsorbed on solid surfaces in real time, it is necessary to develop a technique which combines both temporal and spacial resolution on the scale of molecular motion. This task is tackled with a pump-probe experiment, where Low Energy Electron Diffraction (LEED) probes the collective response of a surface on a laser pump pulse as a function of time delay between pump and probe. We present an electron gun that produces ultra-short electron pulses by two-photon photoemission process when 400nm laser light pulses are focused onto a gold cathode (20nm thick film deposited on sapphire substrate): the electron yield is about 0.5 electron/pulse with 0.5nJ laser pulses with a measured energy resolution of 0.7eV at 100eV. This results in a nominal time resolution of 3ps. As a molecular system we investigate one monolayer of C_{60} on Ag(111), that forms a $2\sqrt{3}$x$2\sqrt{3}$ R30° structure. This system has a low Debye temperature of about 50K and is thus, together with the large mass of C_{60}, well suited for our purpose. First results will be presented and compared to results of static LEED experiments.

O 14.2 Fr 16:00 TU EB407

Temporal evolution of surface structures after fs-laserpulse excitation — •B. Krenzer, A. Janzen, and M. Horn-von Hoegen — Fachbereich Physik, Universität Duisburg-Essen, Universitätsstr. 5, 45117 Essen

Studies of surface-dynamics with fs-timeresolution are very well established using optical methods, e.g. SHG, SFG. Structural informations of the investigated systems, however, are only indirectly accessible. Using ultrashort X-ray pulses a direct determination of bulk structures and their dynamics is possible [1]. The highly enhanced surface sensitivity and higher scattering amplitude of electrons made the development of timeresolved electron diffraction for surface studies desirable. Recently, the construction of electron guns providing fs-electron pulses has been achieved. This progress allows studies of structural changes of thin metal films and adsorbate systems on a ps- to sub-ps timescale [2].

We built an electron diffraction system capable to study surface dynamics. Short electronpulses are directed at glancing angle on surfaces excited by a fs-laserpulse. Depending on the delay between pumping laserpulse and probing electronpulse on the surface the temporal evolution of surface structures can be determined on a ps-timescale (ps-RHEED). In this talk we will present first results obtained with the new system. These investigations were conducted on clean and Bi-covered Si(001)-surfaces.

[1] K. Sokolowski-Tinten et. al., Nature **422**, 286 (2003).
[2] B.J. Siwick et. al., Science **302**, 1382 (2003), C.-Y. Ruan et. al., Science **304**, 80 (2004).

O 14.3 Fr 16:15 TU EB407

Atomically resolved imaging of Stoichiometric CeO_2 (111) — •S. Gritschneder[1], Y. Namai[2], A.S. Foster[3], Y. Iwasawa[2], and M. Reichling[1] — [1]Fachbereich Physik, Universität Osnabrück, Barbarastraße 7, 49076 Osnabrück, Germany — [2]Department of Chemistry, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan — [3]Laboratory of Physics, University of Helsinki, P.O. Box 1100, 02015 HUT, Finland

The (111) surface of CeO_2 in various oxidation states is important for catalytic activity and some of its details relating to surface oxygen atoms have already been studied with dynamic scanning force microscopy. For an in-depth understanding of the surface chemistry of CeO_2(111), it is most interesting to gain insight into the details of surface structural features and to yield an unambiguous interpretation of contrast features observed in dynamic scanning force microscopy results obtained on CeO_2(111). While atomic resolution can routinely be achieved nowadays, interpretation of atomic contrast images is still a non-trivial task. As CeO_2 exhibits the same fluorite structure as the prototype material CaF_2 and contrast formation on CaF_2(111) is quantitatively well understood, we compare atomic contrast formation on both surfaces. On flat terraces, surface ions mostly appear as disk-like features but also other contrast feature like triangular patterns are observed. When scanning at smallest distance, the predominant contrast pattern is a stable honeycomb structure. By theoretical modelling of the imaging process we aim to assign the different contrast patterns to the anionic and the cationic sub-lattices, respectively.

O 14.4 Fr 16:30 TU EB407

Zweidimensionale Legierungsbildung in PtAu Monolagenschichten — •Eleonora Filonenko, Harry Hoster, Hubert Rauscher und R.J. Behm — Abt. Oberflächenchemie und Katalyse, Universität Ulm

Im Rahmen einer Studie zu den (elektro-) katalytischen Eigenschaften wohldefinierter Pt-Au Oberflächen wurde das 2D-Mischungsverhalten der beiden Metalle in Monolagenschichten mittels hochauflösendem STM untersucht. Als Modellsysteme dienten i) Au auf Pt(111) und ii) Pt und Au auf Ru(0001), präpariert durch (sequenzielles) Aufdampfen und nachfolgendes Heizen. Quantitative Analysen atomar aufgelöster STM-Bilder fur verschiedenen Zusammensetzungen zeigen, dass die für das Volumen bekannte schlechte Mischbarkeit von Pt und Au sich in beiden Modellsystemen auch für den zweidimensionalen Fall wiederfindet. Die Resultate werden mit dem Verhalten anderer 2D-Oberflächenlegierungen unterschiedlicher Mischbarkeit verglichen. Thermodynamische und kinetische Aspekte der 2D-Mischbarkeit werden diskutiert.