O 68: Metal Substrates: Adsorption V

Time: Friday 10:15–11:45 Location: H39

O 68.1 Fri 10:15 H39

Argon adsorbed on Ag(111) — •Thomas König, Markus Heyde, Hans-Peter Rust, and Hans-Joachim Freund — Fritz-Haber-Institute of the Max-Planck-Society, Faradayweg 4-6, D-14195 Berlin, Germany

The adsorption of Xe on Ag(111) has been a an interesting task since many years [1,2]. We found that investigations about Ar on Ag(111) are less spread. Here we present the preparation and scanning tunnelling microscopy (STM) characterization of Ar on Ag(111). Our employed setup is similar to the one developed by P.S. Weiss et al. [3] and used by Rust et al. [4]. Characteristic of this setup is a pendulum. The pendulum is thermally coupled to a liquid helium dewar. The preparation of the Ar on Ag(111) was accomplished in a special manner. An Ag(111) sample at room temperature was transferred in the cold microscope located at the end of the pendulum. The pendulum and microscope was pre-dosed by Ar before. The hot Ag(111) sample warms the sample holder from where Ar desorbs. Ar-islands or an Ar-film that covers the surface fully can be observed depending on the concentration of Ar. The electronic structures are mapped by STM measurements. A statistical analysis of the Ar-islands and their formation will be shown. The closed Ar-film shows symmetry properties that will be discussed.

[1] J. Unguris, L.W. Bruch, E.R. Moog, M.B. Webb, Surf. Sci. 109, 522 (1981). [2] M. Caragiu, G.S. Leatherman, Th. Seyller, R.D. Diehl, Surf. Sci. 475, 89 (2001). [3] P.S. Weiss, D.M. Eigler, NATO ASI Series E, 235, 213 (1993). [4] H.-P. Rust, J. Busisset, E.K. Schweizer, L. Cramer, Rev. Sci. Instrum. 68, 129 (1997).

O 68.2 Fri 10:30 H39

Quasi-periodic arrangement of one-dimensional defects in iodine adlayers on Pt(100) — •Björn Braunschweig, Alexej Mitin, and Winfried Daum — Institut für Physik und Physikalische Technologien, TU Clausthal, Leibnizstrasse 4, D-38678 Clausthal-Zellerfeld

Long one-dimensional defects in iodine adlayers on a Pt(100) surface, prepared by flame annealing and subsequently quenching in iodine vapor, have been studied by scanning tunneling microscopy (STM). On Pt(100) iodine forms $(\sqrt{2} \times 5\sqrt{2})$R45° adlayers consisting of closed-packed, defect-free domains and domains with line defects in [010]-direction, parallel to the Pt steps. The density of the line defects depends on the adsorption temperature. Three types of defects have been identified for adsorption temperatures between 870 K and 1300 K. Based on atomically resolved STM images, structural models for the different defect patterns which consist of iodine rows displaced perpendicular to the [010]-direction have been derived. Iodine adsorption at 1100 K leads to the formation of a pattern with a long-range, quasi-periodic arrangement of line defects.

O 68.3 Fri 10:45 H39

Carbon monoxide adsorption sites on roughened Au(111) — •Tobias Nowitzki[1], Wai-Leung Yim[2], Mandus Necke[3], Hanno Schnars[3], Jürgen Biener[4], Monika Biener[4], Volkmar Zielasek[1], Katharina Al-Shamery[3], Thorsten Klüner[2], and Marcus Bäumer[1] — [1]Institut für Angewandte und Physikalische Chemie, Universität Bremen — [2]Institut für Reine und Angewandte Chemie, Theoretische Chemie, Universität Oldenburg — [3]Institut für Reine und Angewandte Chemie, Physikalische Chemie, Universität Oldenburg — [4]Lawrence Livermore National Laboratory

Since Au turned out to be an active catalyst for the oxidation of carbon monoxide, the adsorption properties on various Au surfaces have been studied. Interestingly, a comparable behavior has been revealed for a wide range of surfaces from supported particles to rough single-crystals: two desorption states above 100 K and one infrared signal. The atomistic origins for this behavior have not yet been clarified completely.

To study this effect, we prepared a rough surface by ion-bombarding a Au(111) single-crystal in ultrahigh vacuum and characterized the system by scanning tunneling microscopy, temperature-programmed desorption and infrared spectroscopy. Furthermore, density functional theory calculations were performed for a Au(332) surface exhibiting similar adsorption properties as the roughened Au(111). The results indicate that two distinct kinds of low-coordinated atoms can explain the experimental findings.

O 68.4 Fri 11:00 H39

Adsorption of CO on stepped Rh(553) — •Hans Peter Koch, Priyanka Singnurkar, and Robert Schennach — Graz University of Technology, Institute of Solid State Physics, Graz, Austria

The adsorption of CO on stepped surfaces has so far only been investigated on a limited number of systems. On Pt (112) and (335) for example distinct desorption peaks for CO from the steps and from the terraces were reported [J. Xu, J. Yates Surf. Sci. 327(1995)193]. In this work we show that CO adsorption on the stepped Rh(553) surface behaves surprisingly different. Thermal desorption spectroscopy (TDS) does not show a peak that can be attributed to CO adsorbed on the steps. Angle resolved thermal desorption data show a simple cosine distribution, as would be expected from a (111) surface. Nevertheless, reflection absorption infra red spectroscopy (RAIRS) shows vibrational features that can be attributed to CO molecules adsorbed on the steps. Apparently, the difference in the desorption energy of CO bound on terraces and on steps is not very different according to the TPD results. However, the binding of the CO molecules on the steps and terraces is different enough to show unique vibrational features in RAIRS. The experimental results will be discussed in the light of recent density functional theory calculations.

O 68.5 Fri 11:15 H39

Adsorption of Deuterium and CO on PdRu surface alloys studied by temperature programmed desorption — •Heinrich Hartmann, Thomas Diemant, Joachim Bansmann, and Juergen Behm — Institute of Surface Chemistry and Catalysis, Ulm University, D-89069 Ulm

The adsorption properties of Pd/Ru surface alloys on Ru(0001) were investigated by Temperature Programmed Desorption using D_2 and CO as probe molecules. The surface alloys were created by depositing Pd on a Ru(0001) crystal and subsequent annealing to 1100 K. This results in the replacement of Ru by Pd atoms in the first surface layer. Earlier STM experiments showed a tendency for phase separation between Pd and Ru in the alloy surface. The TPD experiments showed a lower adsorption energy for CO and D_2 on the bimetallic alloy surfaces with respect to Ru(0001) and Pd(111) surfaces, this has been attributed to electronic and ensemble effects on the Pd/Ru surface. Concomitantly the saturation coverage and initial sticking coefficients of D_2 were found to decrease for higher Pd-contents, indicating an activation barrier for D_2 adsorption on the bimetallic surfaces, whereas the saturation coverage and initial sticking coefficients of CO remained unchanged with respect to adsorption on Ru(0001). Concurrently, a shift of the high-temperature end of the spectra to lower temperatures was observed for both adsobates, indicating a destabilization of the remaining Ru adsorption sites or a faster desorption process due to diffusion between adsorption sites of different bonding strength.

O 68.6 Fri 11:30 H39

STM study of the adsorption of Au and Pb on Mo(110) — •Aleksander Krupski[1], Wojciech Linhart[1], Adam Paruszewski[1], Izabela Cebula[1], Zbigniew Jankowski[1], and Tomasz Kobiela[2] — [1]Institute of Experimental Physics, University of Wrocław, Poland — [2]Institute of Physical and Theoretical Chemistry, University of Bonn

Scanning tunneling microscopy (STM) has been used for the first time to investigate the growth of ultrathin Au and Pb films on the Mo(110) surface.