

Surface stress and surface tension at charged solid-liquid interfaces — ●DOMINIK KRAMER¹ and JÖRG WEISSMÜLLER^{1,2} — ¹Institut für Nanotechnologie, Forschungszentrum Karlsruhe, Postfach 3640, 76021 Karlsruhe, Germany — ²Technische Physik, Universität des Saarlandes, 66041 Saarbrücken, Germany

Most experimental and theoretical results of surface stress changes of electrodes support either the view that the variations of surface stress are identical or similar of that of surface tension, i.e. have essentially a quadratic dependence on the potential, or that the basic dependence is a linear function of the charge. By using a simple model of the solid surface and using both the Lippmann equation (which describes the potential dependence of surface tension) and Shuttleworth's equation (which relates stress and tension) we demonstrate that the surface stress can be considered as a sum of two terms. The first one is a linear function of the surface tension; the second one is a linear function of the surface charge density. This comprehensive description allows explaining of the different results and their seeming discrepancies without assuming experimental errors or fundamental thermodynamic problems.

O 67.9 Fri 12:45 H38

Räumlich aufgelöste IR Spektroskopie und elektrochemische Messungen zur nichtlinearen Dynamik der Elektrooxidation von H₂CO Gemischen an Pt-Elektroden — ●PHILIPP BAUER,

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Bei Niedertemperaturbrennstoffzellen vermindert die herstellungsbedingte Kohlenmonoxidverunreinigung des Wasserstoffgases den Wirkungsgrad erheblich. Wir verfolgen den Ansatz, mit Hilfe von Methoden der nichtlinearen Dynamik diesen negativen Effekt zu minimieren.

Berechnungen mit einem System von gekoppelten Differentialgleichungen [1], das die Oxidation von H₂CO an einer Platinelektrode beschreibt, sagen von monostabilem Verhalten über Oszillationen und Domänenbildung bis hin zu komplexer Dynamik, eine Vielzahl von zeitlichen und räumlichen Mustern voraus. Wir stellen experimentell ermittelte Bifurkationsdiagramme, die aus globalen potentiostatischen Messungen gewonnen wurden vor und zeigen erste Ergebnisse zur räumlichen Musterbildung. Hierfür findet ein Infrarotspektrometer mit Focal-Plane-Array in ATR-Konfiguration (abgeschwächte Totalreflexion) Verwendung, mit dem raumzeitliche Muster in der CO Bedeckung abgebildet werden können.

Wir diskutieren, inwiefern durch Kontrolle der Parameter ausgewählte Muster eingestellt werden können, die auch in Gegenwart von CO eine hohe Effizienz der Wasserstoffoxidation erlauben.

[1] J. Siegmeyer, Diplomarbeit, Physik Department, TU-München, München (2005)

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 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 tunneling 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 NOWITZKI¹, WAI-LEUNG YIM², MANDUS NECKE³, HANNO SCHNARS³, JÜRGEN BIENER⁴, MONIKA BIENER⁴, VOLKMAR ZIELASEK¹, KATHARINA AL-SHAMERY³, THORSTEN KLÜNER², and MARCUS BÄUMER¹ — ¹Institut für Angewandte und Physikalische Chemie, Universität Bremen — ²Institut für Reine und Angewandte Chemie, Theoretische Chemie, Universität Oldenburg — ³Institut für Reine und Angewandte Chemie, Physikalische Chemie, Universität Oldenburg — ⁴Lawrence 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