# O 50 Postdeadline-Session

Zeit: Dienstag 20:00–21:00 Raum: TU A151

O 50.1 Di 20:00 TU A151

**New twists of a never-ending story: Water on Ru(001)** — •Dietrich Menzel[1], Nadir Faradzhev[2], Krassimir L. Kostov[1], Peter Feulner[1], and Theorore E. Madey[2] — [1]Physik E20, TU München, Germany — [2]Physics Dept, Rutgers Univ., Piscataway, NJ, USA

Conflicting reports and views exist on the stability of molecular layers of $H_2O$ and $D_2O$ on Ru(001), a model system. The original bilayer model of Madey et al. is not compatible with the LEED geometry; Feibelman concluded from DFT calculations that partial dissociation has to occur for wetting. Further calculations and experiments agreed in some aspects but not in others. Two very recent PRLs (93,196101/2) drew opposite conclusions from nominally identical techniques. We therefore conducted carefully controlled experiments with TPD and XPS in two laboratories, comparing the situation before and after defined irradiation with slow electrons and photons. We find wetting molecular layers on the clean surface for both $H_2O$ and $D_2O$. $D_2O$ is thermally stable to desorption; $H_2O$ partially dissociates thermally to variable extent, but also re-associates upon desorption. Thus the free energies of the various layers are very close and separated by low, mass-dependent barriers. Both layers are extremely sensitive to electron irradiation; even energies of a few eV are effective. This and the influence of small amounts of impurities explain the conflicting experimental results.

O 50.2 Di 20:15 TU A151

**New magnetism of Fe, Co and Ni monolayers grown with oxygen surfactant** — •H. Wende, C. Sorg, N. Ponpandian, A. Scherz, R. Nünthel, and K. Baberschke — Institut für Experimentalphysik, Freie Universität Berlin, Arnimallee 14, D-14195 Berlin-Dahlem, Germany

Surfactant assisted growth of nanoscale structures on surfaces is a well established technique. Moreover, it is known that for a few atomic layers of Fe, Co, and Ni ultrathin films the magnetic properties are highly sensitive to minimal structural changes: If the nearest neighbor distance varies by 0.03-0.05 Å only, the magnetic anisotropy energy may change by $10^2 - 10^3$. So the question arises: Can the growth of the 3d ferromagnets on metallic substrates be improved using oxygen as a surfactant or will an antiferromagnetic metal oxide be formed? The answer is threefold: i) We could indeed show by MEED and XAS that the growth is improved up to >20 ML and that finally the O atoms "float"on top of the ferromagnetic film (see recent perspectives in Surface Science [1] and references therein). ii) Recent measurements demonstrate that the magnetic anisotropy energy is significantly enhanced using this surfactant. Theory reveals that this is mainly due to the decrease in the magnitude of the surface anisotropy. iii) Preliminary experiments of last month at the new BESSY undulator beamline show that the chemisorbed oxygen atoms on the surface of the ferromagnetic film carry an induced magnetic moment. Supported by BMBF (05 KS4 KEB 5) and DFG (Sfb290).

[1] M. Farle, Surf. Sci. Perspectives *in press* (http://dx.doi.org/10.1016/j.susc.2004.10.055)

O 50.3 Di 20:30 TU A151

**Switching between one and two dimensions: conductivity of Pb–induced chain structures on Si(557)** — •C. Tegenkamp, Z. Kallassy, L.H. Günter, V. Zielasek, and H. Pfnür — Institut für Festkörperphysik, Abteilung Oberflächen, Appelstr. 2, 30167 Hannover, Germany

The conductivity of epitaxially grown Pb–structures on Si(557) has been measured using a modified 4-point van der Pauw method. For this sytsem different characteristic transport mechanisms have been found: For coverages above the percolation limit(0.6ML) up to 3ML the electronic transport in the annealed Pb–films is activated. Furthermore, the uniaxial symmetry of the Si(557) surface is reflected directly in a higher conductance in the parallel direction compared to the direction perpendicular to the steps. For coverages higher than 3ML a metallic behavior is found for both directions, i.e. the conductance decreases with increasing temperature.

In contrast, already one ML, but annealed to 640K, leads to the formation of atomic wires, as seen by STM, with an extremely high and quasi one–dimensional surface state conductance along the wire direction. At a critical temperature of $T_c = 78K$, the system switches from a low to a high conductance anisotropy, with a metal–insulator transition in the direction perpendicular to the chain structure, while in the direction along the chains conductance with a (1/T + const.) temperature dependence was found.

STM has shown further, that the 1D/2D transition is associated with an order–disorder phase transition of a 10- fold superperiodicity along the Pb chains as revealed by mesurements done at 40K and 100K, respectively.

O 50.4 Di 20:45 TU A151

**Generation and Detection of Coherent Surface Currents** — •J. Güdde, M. Rohleder, and U. Höfer — Fachbereich Physik und Zentrum für Materialwissenschaften, Philipps-Universität, D-35032 Marburg

We demonstrate the generation and detection of lateral electron currents at a metal surface with a contact-free experimental setup. The currents are induced by two phase-locked ultrashort laser pulses with frequencies $\omega$ and $2\omega$ that generate a population of excited states states which is asymmetric with respect to the direction $+k_\parallel$ and $-k_\parallel$. The relative phase between the two excitation pulses controls the direction of the coherent dc current. The current is detected by time-delayed probe-pulses in terms of an anisotropy of the angle-resolved photoemission yield. This procedure allows to investigate electron transport at surfaces with extremely high sensitivity and gives direct access to the relevant carrier scattering processes. In a first experiment we have excited electrons into the image-potential states of Cu(100) that move with parallel velocities of $\sim 1$ Å/fs and carry a current of up to $10^7$ A/cm$^2$.