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Scanning Nearfield Optical Microscopy (SNOM) is a versatile tool to investigate nanostructured samples. Using a pump-probe setup with a femtosecond laser system as excitation source we have the ability to optically image nanostructures with high spatial and temporal resolution. Another advantage of the probes is the capability to simultaneously perform AFM, thus also gaining topographical information about the sample. This information is essential as local defects on the surface have strong influence on the damping of e.g. localized surface plasmons (LSPs). The nearfield emitted from the SNOM-aperture excites collective electron oscillations. These processes are strongly dependent on the characteristics of the interaction between the sample and the SNOM-tip. Simulations are presented to demonstrate the suitability of the proposed probe designs for time resolved measurements on the subwavelength scale, evaluating transmission capability and pulse dispersion. In the experiment antenna based aperture probes are tailored via focused ion beam milling as well as electron beam lithography of hollow metal coated silicon dioxide pyramids. First measurements on the characterization of the sensors are presented.

O 27.79 Tue 18:30 P2

Spectroscopy of superconducting $V_3Si(001)$ in tunneling and contact regime — Nadine Hauptmann, •Michael Becker, Jörg Kröger, and Richard Berndt — Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel, D-24098 Kiel, Germany

The energy gap of the superconductor V_3Si is monitored on a yet unknown surface reconstruction most likely induced by carbon. Depending on the surface position spectroscopy reveals an asymmetric energy gap. The evolution of the energy gap with decreasing tip-sample distance from the tunneling to the contact regime indicates Andreev reflections in contact spectroscopy. Financial support by the DFG is gratefully acknowledged.

O 27.80 Tue 18:30 P2

Controlling the Kondo Effect in $CoCu_n$ Clusters Atom by Atom — Nicolas Néel[1], •Jörg Kröger[1], Richard Berndt[1], Tim Wehling[2], Alexander Lichtenstein[2], and Mikhail Katsnelson[3] — [1]Christian-Albrechts-Universität zu Kiel, D-24098 Kiel, Germany — [2]Universität Hamburg, D-20355 Hamburg, Germany — [3]Radboud University Nijmegen, NL-6525 AJ Nijmegen, The Netherlands

Clusters containing a single magnetic impurity were investigated by scanning tunneling microscopy, spectroscopy, and *ab initio* electronic structure calculations. The Kondo temperature of a Co atom embedded in Cu clusters on Cu(111) exhibits a non-monotonic variation with the cluster size. Calculations model the experimental observations and demonstrate the importance of the local and anisotropic electronic structure for correlation effects in small clusters. Financial support by the DFG through SFB 668 is acknowledged.

O 27.81 Tue 18:30 P2

Thin epitaxial Bi(111) films on Si(111) studied by ARPES — •Holger Schwab[1], Hendrik Bentmann[1], Frank Forster[1], Luca Moreschini[2], Marco Grioni[2], and Friedrich Reinert[1,3] — [1]Universität Würzburg, Experimentelle Physik II, Am Hubland, D-97074 Würzburg, Germany — [2]Ecole Polytechnique Fédérale de Lausanne (EPFL), Institut de Physique des Nanostructures, CH-1015 Lausanne, Switzerland — [3]Forschungszentrum Karlsruhe, Gemeinschaftslabor für Nanoanalytik, D-76021 Karlsruhe, Germany

Employing angle-resolved photoelectron spectroscopy (ARPES) we have studied thin films of Bi(111) on a Si(111) substrate. The film growth was characterized by reflection high energy electron diffraction (RHEED). We present Fermi surfaces and band structures for different film thicknesses. Quantum well states (QWS) as well asthe Bi(111) surface state are observed. Our measurements are in good agreement with previous results. The variation of the line width of the QWS was measured over a broad temperature range from 70K to 300K. This allows for the determination of the electron-phonon coupling constant λ as a function of film thickness.

O 27.82 Tue 18:30 P2

Spin-resolved inverse photoemission experiments on Ni/GaAs(001) — •Christian Eibl, André Berken, Manuel Prätorius, Anke B. Schmidt, and Markus Donath — Physikalisches Institut, Westfälische Wilhelms-Universität Münster

To understand the interplay between crystal structure, electronic states, and magnetism, it is worthwhile to compare the different ferromagnetic elements. Unfortunately, the thermodynamically stable crystal structures of Ni, Fe, and Co are face-centered cubic (fcc), body-centered cubic (bcc), and hexagonal close-packed (hcp), respectively. Thus, a direct comparison is hampered and scientists endeavor to crystallize Fe, Co, and Ni in a non-native structure.

Recently, it was shown by Tian *et al.* that Ni can be stabilized in the bcc structure on a GaAs(001) substrate. In contrast to the fcc structure, it was found that bcc Ni exhibits different magnetic properties, e.g., Curie temperature and magnetic anisotropy. Additionally, a photoemission experiment revealed differences in the electronic structure below the Fermi level [1].

To gain further insight into the electronic structure of bcc Ni also above the Fermi level, we used spin-resolved inverse photoemission to investigate Ni films on GaAs(001) as a function of thickness. Furthermore, we compared our results with measurements on fcc Ni/Cu(001).

[1] C.S. Tian *et al.*, Phys. Rev. Lett. **94**, 137210 (2005)

O 27.83 Tue 18:30 P2

Comparison of angular resolved photoemission on Pt(110) with DFT bulk band calculations — •Alexander Menzel, Christian Braun, Peter Amann, and Erminald Bertel — Institute forPhysical Chemistry, University of Innsbruck, Austria

Angular resolved photoemission (ARPES) experiments of clean and halogenated Pt(110) are compared with the DFT-derived bulk band structure of Platinum. Numerous dispersion features agree with the calculated one-dimensional density of states (kz-histogram) indicating emission from near surface transitions. In order to distinguish the effects of initial state (surface resonances), matrix element (surface photoemission) and final state (strong photoelectron damping), we varied incident polarization, photon energy, and surface phase symmetry.

O 27.84 Tue 18:30 P2

Electronic fine structures of perfluoropentacene films by ultraviolet photoelectron spectroscopy — •Shunsuke Hosoumi, Shinichi Nagamatsu, Satoshi Kera, and Nobuo Ueno — Chiba University, Japan

Pentacene (PEN) and perfluoropentacene (PFP) are currently the most potential conjugated organic molecules as active materials in novel electronic devices[1]. The intramolecular charge reorganization energy (λ), which is related to the electron-phonon coupling, is important parameter for efficient transport of charges in organic materials and across related interfaces. However, λ has been discussed based on highly-resolved spectra of gas-phase molecules [2]. Recently, we have succeeded to assess λ directly from the fine features in high-resolution UPS of organic solid systems by fabricating a well-ordered monolayer deposited on graphite [3].In this paper, we compare the electronic structures of the well-ordered monolayer both for PEN/graphite and PFP/graphite. The UPS band derived from the highest occupied molecular orbital (HOMO) for both monolayer systems shows fine structures clearly, indicating the molecular vibrational modes strongly couple to photoelectron (HOMO hole). The λ for PFP is about two times larger than PEN. The take-off angle dependence of the UPS spectra that the Franck-Condon principle is not strictly satisfied in the photoionization process will be discussed.

[1] Y. Inoue et al, Jpn, J. Appl. Phys. 44, 3663 (2005). [2] J-L. Bredas et al, Chem. Rev. 104, 4971 (2004). [3] H. Yamane et al, Phys. Rev. B 72, 153412 (2005).

O 27.85 Tue 18:30 P2

Tunneling Spectroscopy of nanoporous networks - comparison of experiment and modelization — •Wolfgang Krenner[1], Dirk Kühne[1], Florian Klappenberger[1], Iñaki Silanes[2], Andres Arnau[2], Javier García de Abajo[3], Svetlana Klyatskaya[4], Mario Ruben[4], and Johannes Barth[1] — [1]Physik Department E20, TU München, Germany — [2]Donostia International Physics Center (DIPC) and Departamento de Fisica de Materiales and Unidad de Fisica de Materiales, E-20018 San Sebastian, Spain — [3]Instituto de Óptica CSIC, Serrano 121, 28006 Madrid, Spain — [4]Institute of Nanotechnology, Forschungszentrum Karlsruhe, Karlsruhe, Germany

We present spectroscopic data obtained by Scanning Tunneling Spectroscopy (STS) from self-assambled organic and metal coordinated carbonitrile polyphenyl (CN-Ph_x-NC) networks deposited on a Ag(111) surface under ultra high vacuum conditions. The molecules form highly regular organic networks depending on the length of the molecules and coverage. By further evaporating Co onto the sample, metal coordinated honeycomb networks are formed by three CN-Ph_x-NC molecules

binding to one Co atom.
These networks impose a modulation upon the local density of states (LDOS) of the quasi 2D electron system of the Ag surface state. Different types of networks were investigated by STS. The lateral confinement of the electrons manifested in various standing wave patterns in dI/dV maps at different energies. First results show good agreement with modelling by a boundary element method.

O 27.86 Tue 18:30 P2

Implementation of the HSE functional in the FLAPW method — •Martin Schlipf, Christoph Friedrich, and Stefan Blügel — Institut für Festkörperforschung and Institute for Advanced Simulation, Forschungszentrum Jülich, D-52425 Jülich, Germany

Despite the remarkable success of density-functional theory (DFT) in the local density (LDA) or the generalized-gradient approximation (GGA) for the exchange-correlation functional, these standard functionals do not properly describe the structural and magnetic properties of oxide materials. This failure can in many cases be attributed to the uncompensated self-interaction error in LDA and GGA. In hybrid functionals that incorporate a portion of Hartree-Fock-like exact exchange the self-interaction error is considerably reduced. Among these the HSE [1] functional proved to give exceptionally good agreement with experimental data. In this contribution, we discuss the realization of the HSE functional within the all-electron full-potential linearized augmented planewave (FLAPW) method, where space is partitioned into muffin-tin spheres centered at the atomic nuclei and the interstitial region. Within the muffin-tin spheres the wave functions are expressed by numerical functions on a radial grid time spherical harmonics, while planewaves are used in the interstitial region. The exchange potential is given by an integral over the attenuated Coulomb interaction and four of these basis functions. We discuss the implementation of these integrals.

[1] Heyd, Scuseria, Ernzerhof, J. Chem. Phys. **118**, 9207 (2003)

O 27.87 Tue 18:30 P2

In situ Epitaxy and Catalysis at the High Resolution Diffraction Beamline at PETRA III — •Carsten Deiter and Oliver H. Seeck — Hasylab am DESY, Notkestr. 85, 22607 Hamburg, Germany

In spring 2009 the new synchrotron radiation source PETRA III will become operational. At the High Resolution Diffraction Beamline (P08) the equipment and the beam parameters are highly suited for surface and interface studies. Beside traditional sample environments such as variable temperature (70K-700K) cells with vacuum (10^{-6}mbar) or inert gas inside, an ultra high vacuum chamber will be available to perform in situ molecular beam epitaxy, sputter cleaning and/or catalysis x-ray experiments. The temperature of the sample can be varied from 100K to 1000K for metals and insulators and from 100K to 1500K for semiconductors, respectively. This chamber will be installed in a six circle diffractometer (Kohzu) for extreme angular resolution and supported by an UHV infrastructure close by.

O 27.88 Tue 18:30 P2

Improved determination of the IMFP by extracting the optimum loss function from EELS — •Tina Graber[1], Frank Forster[1], Achim Schöll[1], and Friedrich Reinert[1,2] — [1]Universität Würzburg, Experimentelle Physik II, Am Hubland, 97074 Würzburg — [2]Gemeinschaftslabor für Nanoanalytik, Forschungszentrum Karlsruhe, 76021 Karlsruhe

A precise knowledge of the inelastic mean free path (IMPF) of electrons in matter is of crucial interest in many respects. If electron spectroscopic techniques are applied in surface and interface science, the attenuation length of the involved electrons has to be established in order to gain information on, e.g., probing depth, adsorbate film thickness, or growth modes. In this work we present a systematic study on the IMFP of electrons in thin films of organic molecules by means of photoelectron spectroscopy (PES) and using the model system PTCDA/Ag(111). This system can be carefully controlled for a precise determination of the IMFP since layer-by-layer growth is necessary. Moreover, an appropriate description of the PES background is needed. For this purpose electron energy loss spectroscopy (EELS) provides valuable information on the relevant loss mechanisms. From the EELS data the optimum loss function can be determined. This loss function was subsequently applied for a Tougaard description of the PES background using the QUASES software[1]. In addition, the dependence of the IMFP on the emission angle has been investigated in order to find evidence for scattering channels or favored emission angles. [1] S. Tougaard, Software Package, Vers. 5.1 (2005)

O 27.89 Tue 18:30 P2

Soft x-ray standing wave excited photoemission experiments on Si/$MoSi_2$ multilayer mirrors — •Frank Schönbohm[1,2], Sven Döring[1,2], Daniel Weier[1,2], Ulf Berges[1,2], Felix Lehmkühler[1,2], Charles S. Fadley[3,4], and Carsten Westphal[1,2] — [1]Fakultät Physik - TU Dortmund, Otto-Hahn-Str. 4, 44221 Dortmund, Germany — [2]DELTA - TU Dortmund, Maria-Goeppert-Mayer-Str. 2, 44227 Dortmund, Germany — [3]Materials Sciences Division, LBNL, Berkeley, CA 94720, USA — [4]University of California, Davis, CA 95616, USA

The structure of thin layers and the formation of interfaces is of particular interest in surface science. Element specific sample analysis can be performed by means of photoelectron spectroscopy but the method lacks of a good spatial resolution. On the other hand, reflectivity measurements show a good depth-resolution without chemical sensitivity. Thus x-ray standing wave measurements were conducted in order to combine the advantages of these methods. We used Si/$MoSi_2$ multilayer mirrors as a sample substrate in order to increase the reflectivity. The measurements were performed at the experimental endstation at Beamline 11 at DELTA at a photon energy of $h\nu = 650\,\mathrm{eV}$. The multilayer was handled in ambient air resulting in an oxidized silicon layer at the surface. This Si layer with its SiO_2 cap was used as a first test system for our XSW measurements. Analysis of the recieved data indicates that the surface oxidation of the upper most Si film results in a SiO_2 layer of 13 Å thickness with a non-oxidized Si-film of 15.5 Å beneath it. In order to check this result we performed hard x-ray reflectivity measurements at $h\nu = 15.2\,\mathrm{keV}$ for comparison at DELTA.

O 27.90 Tue 18:30 P2

Prozessoptimierung der Sputterstrategie von fokussierten Bi-Ionenstrahlen mit Standard "Focused Ion Beam - FIB" Anlagen. — •Rüdiger Schott, Paul Mazarov, Rolf Wernhardt und Andreas D. Wieck — Lehrstuhl für Angewandte Festkörperphysik, Ruhr-Universität Bochum, D-44780 Bochum

Fokussierte Ionenstrahlen sind ein vielfältiges und nützliches Werkzeug in Gebieten der Forschung und Industrie. Die Verwendung von Bismutionen zum lokalen, maskenlosen Ionenätzen in Standard FIB-Anlagen ohne Massenseparator besitzt einige Vorteile gegenüber den meist verwendeten Galliumionen. Die Bismut Flüssigmetallionenquelle [1] liefert schwere, monoisotope Ionen (209 u) und deren Cluster, wobei Teilchen mit einfacher Ladung zu 95% dominant sind. Die schweren Ionen und besonders deren Cluster dringen weniger tief in die Oberfläche der Probe ein, wodurch ihr Energieübertrag an die Oberflächenatome erhöht wird. Dies führt zu einer deutlich höheren Sputterrate und einer geringeren Kontaminationstiefe der Oberfläche. Zusätzlich wird der Ionenätzprozess optimiert, indem Parameter wie die Haltezeit pro Punkt variiert und die Ionenätzbedingungen durch das Vorformen der Probenoberfläche verbessert werden.

[1] P.Mazarov, A. Melnikov, R. Wernhardt, and A. D. Wieck, "Long-life bismuth liquid metal ion source for focussed ion beam application", Applied Surface Science **254**, 7401-7404 (2008).

O 27.91 Tue 18:30 P2

Vielkanal-Spindetektion von niederenergetischen Elektronen — •Michaela Hahn[1], Pavel Lushchyk[1], Gerd Schönhense[1], Andreas Oelsner[2], Daniel Panzer[2], Alexander Krasyuk[3] und Jürgen Kirschner[3] — [1]Institut für Physik, Johannes Gutenberg Universität, Mainz (Germany) — [2]Surface Concept GmbH, Staudingerweg 7, 55128 Mainz (Germany) — [3]Max-Planck-Institut für Mikrostrukturphysik, Halle (Germany)

Die Analyse der Spinpolarisation von Photoelektronen ist für Experimente im Bereich der Atom- und Molekülphysik, der Oberflächen- und Festkörperphysik und vor allem für Untersuchungen von ferromagnetischen Materialien von zentraler Bedeutung. Bisher verwendete Spindetektoren [1] arbeiten 'einkanalig', d.h. monoenergetisch und bei einem Detektionswinkel, was zu einer sehr geringen Messeffizienz führt. Um eine hocheffiziente spinaufgelöste Photoemissionsmessung zu ermöglichen, wird ein Multikanal-Spinpolarimeter in Betrieb genommen. Dieses wird Berechnungen zufolge durch einen Gewinn an Messeffizienz um 2-3 Größenordnungen gekennzeichnet sein. Der neue Spindetektor soll insbesondere in winkelaufgelösten Photoemissionsexperimenten mit Laborlichtquellen bei sehr niedrigen Energien (ARPES) und in Experimenten mit Synchrotronstrahlung im harten Röntgenbereich (HAXPES) zum Einsatz kommen. Ein deutlicher Vorteil ist die Reduzierung der Messzeit hinsichtlich Proben mit reaktiven Oberflächen oder für in-situ präparierte ultradünne Filme.