

# Surfaces, Interfaces and Thin Films

Tuesday, 27.08.2019, Room G 95

Time	ID	SURFACES, INTERFACES AND THIN FILMS I: SURFACE CHEMISTRY Chair: Wolfgang Werner, TU Wien
17:00	201	<p style="text-align: center;"><b>Probing solid-liquid interfaces with tender X-rays</b></p> <p style="text-align: center;"><i>Zbynek Novotny<sup>1,2</sup>, Nicolò Comini<sup>1</sup>, Benjamin Tobler<sup>1</sup>, Dino Aegerter<sup>2</sup>, Emiliana Fabbri<sup>2</sup>, Urs Maier<sup>3</sup>, Luca Artiglia<sup>2</sup>, Jörg Raabe<sup>2</sup>, Thomas Huthwelker<sup>2</sup>, Jürg Osterwalder<sup>1</sup></i> <i><sup>1</sup> University of Zürich, <sup>2</sup> Paul Scherrer Institute, <sup>3</sup> Ferrovac GmbH</i></p> <p>Many important chemical and biological processes occur at the interface between a solid and a liquid. Despite its importance, it is very difficult to collect meaningful signals from this buried interface. We recently built a new instrument at the Swiss Light Source that combines ambient-pressure X-ray photoelectron spectroscopy with in-situ electrochemistry. With this new setup, we can stabilize a thin liquid film by a dip&amp;pull method and using tender X-rays, we can probe the solid-liquid interface while having potential control over the electrolyte film. We will present results from the first commissioning beamtime and outline the future direction we are going to pursue.</p>
17:30	202	<p style="text-align: center;"><b>Electron Dynamics on Cu<sub>2</sub>O(111) Probed with Time-Resolved Photoemission</b></p> <p style="text-align: center;"><i>Lisa Grad<sup>1</sup>, Zbynek Novotny<sup>1,2</sup>, Matthias Hengsberger<sup>1</sup>, Jürg Osterwalder<sup>1</sup></i> <i><sup>1</sup> Universität Zürich, <sup>2</sup> Paul Scherrer Institut</i></p> <p>Cuprous oxide is a promising material for light absorption and charge separation in photoelectrochemical cells for solar water splitting. We have investigated the electron dynamics on the (111) surface of Cu<sub>2</sub>O. Depending on the defect concentration, this surface shows two different reconstructions. For the (1x1) structure a fast relaxation of a higher conduction band into the conduction band minimum takes place, followed by a slow depopulation of the latter (20 ps). For the (√3x√3)R30° surface, the properties change drastically. Comparative studies show that the defect density and band bending play key roles in the dynamics at these surfaces.</p>
17:45	203	<p style="text-align: center;"><b>Characterization of Sb<sub>2</sub>Se<sub>3</sub> single crystal surfaces for photocatalysis</b></p> <p style="text-align: center;"><i>Roberta Totani<sup>1</sup>, Fabian von Rohr<sup>1</sup>, Wolf-Dietrich Zabka<sup>2</sup>, Zbynek Novotny<sup>2</sup>, Jürg Osterwalder<sup>2</sup></i> <i><sup>1</sup> Department of Chemistry, University of Zürich, <sup>2</sup> Department of Physics, University of Zürich</i></p> <p>Photocatalytic water splitting allows storing solar energy as chemical energy. For large scale application in photoelectrochemical (PEC) cells, electrode materials need to be efficient and stable. In this work we investigate single-crystalline antimony selenide (Sb<sub>2</sub>Se<sub>3</sub>), a p-type semiconductor with excellent light absorbing properties and promising stability towards photocorrosion in aqueous environment. We studied cleaved Sb<sub>2</sub>Se<sub>3</sub> surfaces with respect to their structural and electronic properties by means of XPS, XPD, LÉED, STM and ARPES. The samples cleave along the (100) planes and the surface shows a pronounced one-dimensional structure, reflecting the zig-zag stacking of ribbons in the bulk crystal structure.</p>
18:00	204	<p style="text-align: center;"><b>Nanovoids in hexagonal boron nitride monolayer</b></p> <p style="text-align: center;"><i>Huanyao Cun<sup>1,2</sup>, Marcella Iannuzzi<sup>3</sup>, Adrian Hemmi<sup>1</sup>, Silvan Roth<sup>1</sup>, Jürg Osterwalder<sup>1</sup>, Aleksandra Radenovic<sup>2</sup>, Thomas Greber<sup>1</sup></i> <i><sup>1</sup> Physik-Institut, Universität Zürich, Winterthurerstrasse 190, CH-8057 Zürich</i> <i><sup>2</sup> Laboratory of Nanoscale Biology, Institute of Bioengineering, EPFL, CH-1015 Lausanne</i> <i><sup>3</sup> Department of Chemistry, Universität Zürich, Winterthurerstrasse 190, CH- 8057 Zürich</i></p> <p>The hexagonal boron nitride (<i>h</i>-BN) nanomesh that forms on Rh(111) has a corrugated honeycomb structure with 3.2 nm periodicity, which consists of "pore" and "wire" regions [1, 2]. In the present study, we demonstrate that 2 nm voids can be fabricated at the pore sites in the <i>h</i>-BN monolayer with unique two-step process in vacuum [3, 4], and can be further delaminated from a Rh substrate with electrochemical method onto arbitrary substrates outside of vacuum as nanoporous membranes [5]. Results from photoemission, scanning tunneling microscopy and density functional theory will be reported.</p>

		<p>[1] M. Corso et al., Science, 303 (2004), 217-220.  [2] S. Berner et al., Angew. Chem. Int. Ed., 46 (2007), 5115-5119  [3] H. Y. Cun et al., Nano Lett., 13 (2013), 2098-2103.  [4] H. Y. Cun et al., ACS Nano, 8 (2014), 7423-7431.  [5] H. Y. Cun et al., Nano Lett., 18 (2018), 1205-1212.</p>
18:15	205	<p><b>Single-domain growth of h-BN on a "quasi-liquid" Pt(110) surface</b></p> <p><i>Dominik Steiner<sup>1</sup>, Erminald Bertel<sup>1</sup>, Florian Mittendorfer<sup>2</sup></i>  <sup>1</sup> University of Innsbruck, <sup>2</sup> TU Wien</p> <p>The growth of hexagonal Boron Nitride (h-BN) monolayers on Pt(110) was investigated by STM, LEED and DFT calculations. Borazine exposure at T &lt; 1100 K yields an h-BN film with defects and domain boundaries on a rough Pt surface as previously reported by Achilli et al. [Nanotechnology 29 (2018) 485201]. Deposition at T &gt; 1100 K results in a perfect single-domain h-BN layer on a flat Pt(110) surface. The lattice misfit is accommodated by converting the (1x2)-missing-row (mr) of clean Pt(110) into a (1xn)-mr reconstruction (n = 5 or 6). This is a rare case of epitaxial growth on a "quasi-liquid" surface where the substrate responds to the adlayer geometry rather than the other way round.</p>
18:30	206	<p><b>On-surface synthesis and substrate transfer of aligned graphene nanoribbons</b></p> <p><i>Rimah Darawish<sup>1</sup>, Gabriela Borin Barin<sup>1</sup>, Jan Overbeck<sup>2</sup>, Akimitsu Narita<sup>3</sup>, Klaus Müllen<sup>3</sup>, Michel Calame<sup>2</sup>, Pascal Ruffieux<sup>1</sup>, Roman Fasel<sup>1</sup></i>  <sup>1</sup> nanotech@surfaces Laboratory, Empa, <sup>2</sup> Transport at Nanoscale Interfaces Laboratory, Empa, <sup>3</sup> Max Plank Institute for Polymer Research</p> <p>On-surface synthesis enables fabrication of graphene nanoribbons (GNRs) with atomically precise edges and ribbon width which allows tuning their electronic bandgap. This feature makes GNRs interesting candidates for application in room temperature switching devices like field effect transistors (FETs). However, integrating GNRs as the active material in FETs poses great challenges concerning contact area and yield. This contribution addresses some of the critical challenges in the further development of GNR technologies, in particular on GNR fabrication, substrate transfer and GNR characterization.</p>
18:45	207	<p><b>Origin of enantio- and regioselectivity for the PdGa (111)-supported Huisgen reaction: experiment and theory</b></p> <p><i>Martina Danese<sup>1,2</sup>, Samuel Stolz<sup>1,2</sup>, Roland Widmer<sup>1</sup>, Daniele Passerone<sup>1</sup></i>  <sup>1</sup> EMPA, <sup>2</sup> EPFL</p> <p>PdGa(111) surface is of remarkable interest because of its enantio- and region-selective properties. In this work we present experimental and theoretical results concerning the PdGa-catalysed Huisgen cycloaddition (in the Figure, experimental STM images of reactants and products on PdGa(111)), with particular focus on the DFT modelling of the compounds. The calculations were performed treating exchange and correlation as well as van der Waals forces with increasing levels of accuracy. Thanks to this technique, we identified the origin of the extremely high enantiomeric excess observed, together with the most favourable adsorption sites. Eventually, the source of the regioselectivity is analysed and the role of possible modifications of the substrate is discussed.</p>
19:00		
19:30		<b>Public Lecture</b>

Time	ID	<p style="text-align: center;"><b>SURFACES, INTERFACES AND THIN FILMS II:</b>  <b>MOLECULAR ADSORPTION AND ADVANCED METHODS</b>  <i>Chair: Zbynek Novotny, Uni Zürich</i></p>
14:00	211	<p style="text-align: center;"><b>Investigating charge-state transitions of molecules on insulating films by atomic force microscopy</b></p> <p style="text-align: center;"><i>Shadi Fatayer, IBM Research – Zurich, Rüschlikon</i></p> <p>Investigating charged molecules on insulating films is experimentally challenging. Atomic force microscopy, with single-electron sensitivity and capable of operating on insulating substrates, is a promising technique for such studies. Here we demonstrate multiple charge-state stabilization of molecules, induce intermolecular single-electron transfer and show that the charge state of a complex plays a role in its on-surface chemical reaction on multilayer insulating films. Moreover, we perform tunneling spectroscopy by using the atomic force microscope as a current meter, where we count single-electron tunneling events. This allows the quantification of the reorganization energy of a molecule on an insulating substrate.</p>
14:30	212	<p style="text-align: center;"><b>Energy-level Alignment for Tetraphenylporphyrins on Oxide surfaces</b></p> <p style="text-align: center;"><i>Silviya Ninova, Michel Bockstedte, University of Salzburg</i></p> <p>Porphyrin-substrate hybrid systems are the building blocks in a series of materials, such as the organic light-emitting diodes, chemical sensors and dye-sensitized solar cells. Understanding and correctly describing the way molecules interact with the substrate upon adsorption hold the key to the prediction and improvement of the present-day devices. Recently, distinct features were observed in the photoemission spectra of Co(II)-tetraphenylporphyrin on Mg(100) related to the molecular monolayer and film [1]. Here we investigate the structural and electronic changes the molecule undergoes upon deposition in the framework of hybrid density-functional theory and beyond it. Our simulations of adsorption at different surface sites give an insight into the underlying interaction as compared to the crystal.</p> <p>[1] Franke et.al., Phys.Chem.Chem.Phys., 2017, 19, 11549-11553</p>
14:45	213	<p style="text-align: center;"><b>Charge Transfer at Metal-Organic Interfaces Promoted by Dielectric Interlayers: a Comparison of Different Organic Molecular Monolayers on the MgO/Ag(100)-Surface</b></p> <p style="text-align: center;"><i>Christian S. Kern, Michael Hollerer, Larissa Egger, Philipp Hurdax, Michael Ramsey, Martin Sterrer, Peter Puschnig, University of Graz</i></p> <p>Metal-organic interfaces are systems of great interest for both fundamental concepts in electronic structure theory and numerous promising technological applications. Recently, it was demonstrated that an insulating interlayer of MgO on an Ag(100) surface does not simply decouple the metal- and organic-layer but actively promotes charge transfer. While this has been shown for the case of pentacene on MgO/Ag(100) [1], it is interesting to further explore the conditions for charge transfer. Different molecular monolayers on the same surface are studied, aiming at revealing trends in terms of the molecule's electron affinity and size. Here, we present DFT calculations for monolayers of pentacene, PTCDA and H<sub>2</sub>TPP on MgO/Ag(100) and compare our results to experimental findings.</p> <p>[1] M. Hollerer. ACS Nano 11, 6252-6260(2017)</p>

15:00	214	<p style="text-align: center;"><b>Aurophilic interactions on surfaces</b></p> <p style="text-align: center;"><i>Thorsten Wagner, Michael Brunthaler, Michael Györök, Petra Gründlinger, Uwe Monkowius, Peter Zeppenfeld, Johannes Kepler Universität Linz</i></p> <p>Metal complexes containing gold in the formal oxidation state +I exhibit a very strong metallophilic interaction, which is often decisive for their arrangement in the solid state. To study this attractive interaction on surfaces, we investigated films with a thickness of just a few layers of 2-naphthyl-isonitrile-gold(I)-chloride on Au(111) and Au(110) surfaces. The physical vapor deposition was monitored by means of differential reflectance spectroscopy (DRS) and photoelectron emission microscopy (PEEM). After growth, the structures were characterized by means of scanning tunneling microscopy (STM) and low energy electron diffraction (LEED). In fact, the Au(110)(1x2) reconstruction of the substrate surface is lifted upon adsorption of the molecules suggesting a sizable interaction between Au(I) complexes and the Au substrate.</p>
15:15	215	<p style="text-align: center;"><b>Fusion of alkyl groups to form phenyl rings: a new on-surface reaction</b></p> <p style="text-align: center;"><i>Amogh Kinikar, Marco Di Giovannantonio, José Ignacio Urgel, Kristjan Eimre, Carlo Pignedoli, Pascal Ruffieux, Roman Fasel, Empa</i></p> <p>On-surface synthesis allows to design carbon nanostructures such as graphene nanoribbons with atomic precision. However, the variety of conceivable structures critically depends on the number of available reaction concepts. Here, we present a new surface-assisted reaction allowing for the controlled fusion of two alkyl groups to form a phenyl ring. Scanning tunneling and non-contact atomic force microscopy images at different stages of the reaction along with DFT simulations allow to elucidate the reaction mechanism. Furthermore, we study the influence of surface templating by comparing the reaction on Au(111) and Au(110). The selective formation of phenyl rings by the fusion of alkyl groups on-surface is unprecedented, and introduces a powerful new motif in the design of novel nanomaterials.</p>
15:30	216	<p style="text-align: center;"><b>On-surface synthesis and characterization of N-doped undecacene: a combined experimental and theoretical study</b></p> <p style="text-align: center;"><i>Kristjan Eimre<sup>1</sup>, José Ignacio Urgel<sup>1</sup>, Hironobu Hayashi<sup>2</sup>, Pascal Ruffieux<sup>1</sup>, Daniele Passerone<sup>1</sup>, Hiroko Yamada<sup>2</sup>, Carlo Antonio Pignedoli<sup>1</sup>, Roman Fasel<sup>1</sup></i> <sup>1</sup> Empa <sup>2</sup> Graduate School of Materials Science, Nara Institute of Science and Technology (NAIST)</p> <p>Acenes are a class of polycyclic aromatic hydrocarbons that exhibit impressive semiconductor and open-shell properties. These unique properties can be tailored to potential applications by altering the conjugated <math>\pi</math>-system with chemical doping. The synthesis of large acenes via traditional solution-chemistry route is hindered by their poor solubility and high reactivity. In this work, we present the on-surface synthesis of undecacene doped with nitrogen atoms replacing the edge carbon atoms of the third outer benzenoid rings. The N-doped undecacene is characterized by scanning tunneling and non-contact atomic force microscopy on Au(111), supported by density functional theory and GW calculations. Furthermore, we use ab initio simulations to characterize the effects of the doping to the aromaticity and open-shell properties of the system.</p>
15:45	217	<p style="text-align: center;"><b>Bloch-wave damping by Plasmons in Highly Oriented Pyrolytic Graphite</b></p> <p style="text-align: center;"><i>Wolfgang Werner, Vytautas Astašauskas, Philipp Ziegler, TU Vienna</i></p> <p>Differential very low energy electron diffraction spectra have been measured on a Highly Oriented Pyrolytic Graphite (HOPG) surface in the range of landing energies from 0 - 1600 eV. The reflectivity in the band gap, in between the interlayer resonances, differs from unity, implying that the vacuum wave function can penetrate the surface, but it is strongly damped via excitation of <math>\pi</math>- and <math>\pi + \sigma</math>-plasmon excitation. This is also true, albeit to a much lesser extent for wave functions for allowed states in the one electron band structure. Measurements of time correlated electron pairs (electron coincidence spectroscopy) show that plasmon decay leads to emission of secondary electrons via the interlayer resonances. The results exemplify the momentum exciton picture of plasmon excitation and decay.</p>

16:00	218	<p align="center"><b>Direct measurements of contact resistance in MoS<sub>2</sub>-based thin film transistors via Kelvin probe force microscopy</b></p> <p align="center"><i>Aleksandar Matkovic<sup>1</sup>, Andreas Petritz<sup>2</sup>, Gerburg Schider<sup>2</sup>, Markus Krammer<sup>3</sup>, Markus Kratzer<sup>1</sup>, Esther Karner-Petritz<sup>2</sup>, Alexander Fian<sup>2</sup>, Herbert Gold<sup>2</sup>, Michael Gärtner<sup>4</sup>, Andreas Terfort<sup>4</sup>, Christian Teichert<sup>1</sup>, Egbert Zojer<sup>3</sup>, Karin Zojer<sup>3</sup>, Barbara Stadlober<sup>2</sup></i></p> <p align="center"><sup>1</sup> Institute of Physics, Montanuniversität Leoben  <sup>2</sup> Joanneum Research MATERIALS, Weiz, Austria  <sup>3</sup> Institute of Solid State Physics, NAWI Graz, Graz University of Technology  <sup>4</sup> Institut für Anorganische und Analytische Chemie, Goethe-University Frankfurt, Germany</p> <p>This study aims at direct imaging of contact resistance in MoS<sub>2</sub>-based thin film transistors (TFTs). Exfoliated single-crystal flakes of MoS<sub>2</sub> have been used in a bottom-contact TFT configuration. Pyrimidine-containing self-assembled monolayers (SAMs) were employed to tune the work function of gold electrodes. Kelvin probe force microscopy measurements were carried out during operation of the devices in order to directly image potential drops across the channel and to study the influence of different SAM treatments on the contact resistance. By independently imaging potential drops at both carrier injection and extraction points, we demonstrate asymmetry of contact resistances in MoS<sub>2</sub>-based TFTs, as well as their non-linear and bias-dependent behavior.</p>
16:15	219	<p align="center"><b>InteractiveXRDFit: a new tool to simulate and fit X-ray diffractograms of oxide thin films and heterostructures</b></p> <p align="center"><i>Céline Lichtensteiger, University of Geneva</i></p> <p>InteractiveXRDFit is a Matlab program that calculates the X-ray diffracted intensity for heterostructures. The user can choose the substrate and the different materials composing an heterostructure among a long list of compounds, choose between (001) or (111) substrate orientation, and play with the different structural parameters (unit-cell size and number of layers). It is possible to build a superlattice composed of up to three different materials, and add a top and/or bottom layer. Each layer can have a different c-axis, either constant or varying as a function of depth within a layer. The simulation is quick and allows the user to compare it directly to the measurements, so as to rapidly determine the crystalline parameters of the sample.</p>
16:30		<b>END; Coffee Break</b>
19:00		<b>Postersession with Apéro</b>
20:30		

ID	<b>SURFACES, INTERFACES AND THIN FILMS POSTER</b>	
231	<p align="center"><b>Material characterization with positrons - Unique and complementary insights</b></p> <p align="center"><i>Lars Gerchow, Paolo Crivelli, ETH Zürich</i></p> <p>The functionalizing of downscaled solids by precise engineering of small defects, voids, porous structure and the amount, distribution and connectivity of such is a vibrant field of research and in demand of improved descriptors to successfully discriminate the increasing complexity. Positron Annihilation Spectroscopy (PAS) as a non-destructive method employing the unique sensitivity of the annihilation characteristics of positrons to their immediate electronic environment on the nanometer scale hereby yields complementary insight to established techniques. Acting as a dynamic local probe, positrons are able to resolve the smallest structural features in various depth and concentrations. We present recent breakthroughs in the characterization of hierarchical porous materials and highlight other high-impact applications with PAS.</p>	
232	<p align="center"><b>Modulated magnetic-field susceptibility measurements for in-situ studies of organic/ferromagnetic interfaces</b></p> <p align="center"><i>Aleksander Brozyniak, Michael Hohage, Mariella Denk, Andrea Navarro-Quezada, Peter Zeppenfeld, Johannes Kepler Universität Linz</i></p> <p>In this work we present the implementation of a sinusoidal modulation of the magnetic field to a Reflectance Difference Magneto-Optical Kerr Effect (RDMOKE) setup with increased sensitivity that allows detecting variations of the Kerr rotation angle below 1 <math>\mu</math>rad/mT at applied fields of a few mT. We illustrate the capabilities of the setup for Ni thin films grown on Cu(110)-(2x1)O surfaces that exhibit a sharp spin reorientation</p>	

	<p>transition (SRT) of the magnetic easy axis from in-plane to out-of-plane at a coverage of 9 ML. Additional frequency analysis of the magneto-optic response to the magnetic field reveals new details of the Ni-SRT and demonstrates the potential of the setup for studying ultrathin organic/ferromagnetic interfaces.</p>
233	<p><b>Role of the surface structure in determining ferroelectric polarization direction</b></p> <p><i>Chiara Gattinoni, Nives Strkalj, Manfred Fiebig, Morgan Trassin, Nicola Spaldin, ETH Zürich</i></p> <p>Interest in ferroelectric perovskites is due to their applications in electronics, and thin films are especially relevant. However, bulk properties, such as ferroelectricity itself, can be compromised at reduced scale. In this work, ferroelectric lead titanate (PTO) thin films are investigated. Experimental (second harmonic generation) and computational (density functional theory) methods were employed to study thin films of PTO(100). It was found that the polarization in the film is strongly influenced by the geometric and electronic structure of the surface. A stoichiometric PTO(001) surface has a strongly reduced polarization which can be restored by the deposition of adsorbates [1, 2].</p> <p>[1] D. D. Fong et al., Phys. Rev. Lett., 96:127601 (2006). [2] M. Stengel, Phys. Rev. B, 84:205432 (2011).</p>
234	<p><b>Probing the origin of ferromagnetic stability in LSMO/SRO</b></p> <p><i>Anna Zakharova, Paul Scherrer Institute</i></p> <p>In this project we used X-ray Absorption Spectroscopy, X-ray Linear and Magnetic Circular Dichroism at the Mn <math>L_{2,3}</math>-edges to understand the ferromagnetic stability in <math>La_{0.7}Sr_{0.3}MnO_3</math>(LSMO) when interfaced with <math>SrRuO_3</math>(SRO), which is absent for the LSMO//<math>SrTiO_3</math>(STO). It has been proposed that charge transfer at the interface between LSMO and SRO allow the <math>dx^2-y^2</math> orbital to mediate the in-plane double exchange, which stabilizes the ferromagnetic ordering of LSMO down to 1-2 unit cells. We have probed the orbital anisotropy and magnetism of LSMO in LSMO/SRO bilayers varying thickness of LSMO(2/4/8/15 u.c.) and SRO(3/20 u.c.). Antiferromagnetic coupling of 2 and 4 u.c. LSMO with SRO was observed even below critical thickness of LSMO. LSMO/SRO data shows <math>d_{3z^2-r^2}</math> preferential occupation below 15 u.c LSMO. Our result is in agreement with theoretical prediction.</p>
235	<p><b>Development of a Low-Temperature Scanning Field Emission Microscope with Spin Polarization Analysis</b></p> <p><i>Ann-Katrin Thamm, Thomas Michlmayr, Urs Ramsperger, Danilo Pescia, ETH Zürich</i></p> <p>In the last years we established a new technology by using an in-house build STM in field emission regime. The emitter source (STM tip) is placed few nanometers away from the sample, where direct tunneling is suppressed. A part of the primary beam is backscattered (elastic and inelastic) from the sample and can escape the tip-target junction. The spin polarization of these electrons, which is a fingerprint of the surface magnetization, is analyzed with a Mott detector. We develop a new low-temperature STM (4 K) not only to increase the stability of the experiment and to reduce noise but also to be able to study fundamental spin structures.</p>
236	<p><b>Electronic properties of hexagonal Boron Nitride on Pt(110)</b></p> <p><i>Marco Thaler<sup>1</sup>, Florian Mittendorfer<sup>2</sup>, Dominik Steiner<sup>1</sup>, Erminald Bertel<sup>1</sup>, Alexander Menzel<sup>1</sup></i>  <sup>1</sup> University of Innsbruck, <sup>2</sup> TU Wien</p> <p>The electronic properties of a hexagonal Boron Nitride (h-BN) monolayer on Pt(110) were investigated by ARUPS and compared to DFT-calculations. A work function change of about -0.74 eV between the h-BN covered Pt(110) surface compared to pristine Pt(110) indicates a net charge transfer from h-BN to Pt. The measured electronic band structure is similar to previously reported band dispersions of h-BN monolayers on transition metals (e.g. Pd(111) [1]) as expected for a weakly interacting adlayer. Due to the (1x5) missing-row-reconstruction of the h-BN/Pt(110) surface, additional umklapp bands in the dispersion plot can be found, which have not been reported on Pt(110) yet [2].</p> <p>[1] Morscher et al. Surf. Sci. 600 (2006) 3280–4  [2] Achilli et al. Nanotechnology 29 (2018) 485201</p>

237	<p style="text-align: center;"><b>Exploring the electron transfer at cuprate/manganite interfaces</b></p> <p style="text-align: center;"><i>Roxana Gaina <sup>1</sup>, Edith Perret <sup>2</sup>, Cinthia Piamonteze <sup>3</sup>, Christian Bernhard <sup>1</sup></i>  <sup>1</sup> University of Fribourg, <sup>2</sup> EMPA, <sup>3</sup> Paul Scherrer Institut</p> <p>The interface effects in cuprate/manganite multilayers are the subject of many studies, which are focused not only on superconducting properties of antagonistic YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> (YBCO), but also on its magnetic and electronic properties. In this study we will present our last investigations that proved that in Nd<sub>1-x</sub>(Ca<sub>1-y</sub>Sr<sub>y</sub>)MnO<sub>3</sub>/YBCO/NCSMO (NYN) trilayers, the interfacial electron transfer and the orbital reconstruction of the interfacial Cu ions depend significantly on hole doping x, tolerance factor (strontium ratio y), and the subsequent charge/orbital order of the manganite. This interface phenomena can potentially lead to combined superconducting/charge-ordered quantum states in YBCO that can be adjusted via manganite layers and external control parameters like magnetic field or photons, which is an exciting prospect for future technologies.</p>
238	<p style="text-align: center;"><b>Detection and Analysis of Low-Energy Electrons by means of a Miniature Energy Analyser: Experimental Characterisation and Preliminary Results</b></p> <p style="text-align: center;"><i>Alessandra Bellissimo <sup>1</sup>, Danilo Pescia <sup>1</sup>, Ashish Suri <sup>2</sup>, Christopher Walker <sup>3</sup>, Steve Tear <sup>3</sup></i>  <sup>1</sup> Laboratory for Solid State Physics, ETH Zürich, <sup>2</sup> Department of Electronics, University of York, <sup>3</sup> Department of Physics, University of York</p> <p>With the aim of improving detection and analysis of Low-Energy and Secondary Electrons (LEEs and SEs of <math>\leq 100</math> eV) in the Scanning Field-Emission Microscope (SFEM) tests are performed on a miniature electron detection unit employing a Bessel Box energy analyser. In electron microscopes, detection of LEEs is inherently difficult due to the presence of electrostatic (and magnetic) fields in proximity of the beam-target interaction region, inhibiting the escape of SEs and complicating the interpretation of their detected signal. The reduced dimensions of such a compact energy analyser (length of 1 &amp; 1/2 channeltrons) consents its employment close to the sample surface, thus minimising the aforementioned fields effects. Experimental results demonstrating the capability of this analyser to collect electron spectra are discussed.</p>
239	<p style="text-align: center;"><b>Multi-parameter Analysis of Genesis and Evolution of Secondary Electrons in the Low-Energy Regime</b></p> <p style="text-align: center;"><i>Alessandra Bellissimo <sup>1</sup>, Giovanni Stefani <sup>2</sup>, Mauro Taborelli <sup>3</sup>, Vytautas Astašauskas <sup>4</sup>, Wolfgang Werner <sup>4</sup></i>  <sup>1</sup> Laboratory for Solid State Physics, ETH Zürich, <sup>2</sup> Università degli Studi Roma Tre, <sup>3</sup> CERN, <sup>4</sup> TU Wien</p> <p>The tangled processes involved in electron-induced Secondary Electron Emission (SEE), responsible for the generation of the ubiquitous Secondary Electrons in a solid surface, are discussed. The interaction of Low-Energy (LE) Electrons with diverse surfaces, of varying long-range order, was investigated by combining measurements of the Total Electron Yield, single-electron as well as (e,2e)-coincidence spectroscopies. The elementary processes relevant for the understanding of SE-generation probability are identified and fully take into account both conservation laws in the collision and the band structure of the solid. Single ionising scattering events, assisted by collective excitations, i.e. plasmons, constitute one of the fundamental ingredients leading to SEE. In the LE-regime the electron yield of a material is strongly dictated by the target band structure.</p>
240	<p style="text-align: center;"><b>Solvent induced crystallization and physical properties of silk sericin film</b></p> <p style="text-align: center;"><i>In Chul Um, Yoon Nam Jo, Kyungpook National University, Korea</i></p> <p>A new solvent, formic acid, was used to fabricate sericin films. The effects of formic acid on the structural characteristics and mechanical properties of the sericin films were examined and compared with water. The gelation of sericin solution was retarded in formic acid compared to that of water. Sericin films cast from the formic acid exhibited a much higher crystallinity index than that produced from water. The tensile strength and elongation of the sericin films cast from the formic acid solution were more than double that of the sericin films cast from water. It is expected that high-crystallinity sericin films, which have significantly improved mechanical properties, produced by using formic acid could be utilized in biomedical and cosmetic applications.</p>