

O 38: Poster: Organic Molecules on Inorganic Substrates II

Time: Tuesday 18:00–20:00

Location: P2/EG

O 38.1 Tue 18:00 P2/EG

Engineering two-dimensional metal-organic networks on ferromagnetic surfaces — ●MARTIN ANSTETT¹, LU LYU¹, KA MAN YU¹, MARTIN AESCHLIMANN¹, and BENJAMIN STADTMÜLLER^{1,2} — ¹Department of Physics and Research Center OPTIMAS, University of Kaiserslautern, 67663 Kaiserslautern, Germany — ²Institute of Physics, Johannes Gutenberg University Mainz, 55128 Mainz, Germany

Two-dimensional metal-organic networks (MONs) on noble-metal surfaces have been identified as versatile nanoarchitecture to manipulate electronic and magnetic properties at surfaces. In this contribution, we discuss the growth and the structure formation of a Co-T4PT network on epitaxial Co films grown on an Au(111) single crystal. Using scanning tunnelling microscopy, we will show that the T4PT molecules can coordinate with native Co adatoms forming a long-range ordered two-dimensional porous network structure. This network can further act as a decoupling and templating layer for the subsequent growth of C60 guest molecules. For a C60 sub-monolayer, we find that the periodicity of the network structure mainly determines the adsorption configurations of isolated C60 molecules while the structural properties of ordered C60 islands on the Co-T4PT network are substantially influenced by the intermolecular interaction between the C60 molecules. The findings show that the MON system can be a very flexible template to tailor the interfacial properties of molecular assemblies for molecular-based spintronics and electronics.

O 38.2 Tue 18:00 P2/EG

Film growth and stability of the Ionic Liquid [C₁C₁Im][Tf₂N] on Pt(111) — ●TIMO TALWAR, STEPHEN MASSICOT, AFRA GEZMIS, CYNTHIA FERNÁNDEZ, LEONHARD WINTER, FLORIAN MAIER, and HANS-PETER STEINRÜCK — Lehrstuhl für Physikalische Chemie 2, Friedrich-Alexander-Universität Erlangen-Nürnberg, Egerlandstr. 3, 91058 Erlangen

Solid catalyst with Ionic Liquid Layer (SCILL) is a new catalytic concept using the advantageous properties of Ionic Liquids (ILs) to improve the catalytic performance such as selectivity and long-term stability of a solid catalyst by the coated IL. In this context, extensive knowledge about the IL-metal interface properties is highly desired.

In this study, the growth and thermal behavior of ultrathin films of 1,3-dimethylimidazolium bis[(trifluoromethyl)sulfonyl]imide [C₁C₁Im][Tf₂N] on Pt(111) are investigated under UHV conditions. The films are prepared in vacuum by physical vapor deposition and measured by angle-resolved and temperature-programmed X-ray photoelectron spectroscopy. Complementary information is gained by Scanning Tunneling Microscopy. At 200 K, an intact closed wetting layer can be deposited on Pt(111). The underlying growth mode is 2D up to 0.5 ML (a closed wetting layer) and moderate 3D for higher coverages. At higher temperatures up to 360 K, the IL continuously decomposes leading to desorption of volatile decomposition products. We will compare this behavior to previous results for this IL on the less-reactive Cu(111) and on the non-reactive Au(111) surface.

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O 38.3 Tue 18:00 P2/EG

Thiahelicene non-covalent molecular wires on Cu(111) — ●GEMA NAVARRO¹, ANTOINE HINAUT¹, SHUYU HUANG¹, THILO GLATZEL¹, AKIMITSU NARITA², and ERNST MEYER¹ — ¹Department of Physics, University of Basel, Klingelbergstrasse 82, 4056 Basel, Switzerland. — ²Okinawa Institute of Science and Technology Graduate University, Okinawa 904-0495, Japan

In recent years molecular nanowires have attained a paramount interest due to their potential application in the next generation of nanodevice. Therefore, researchers have been focused in the development of novel synthetic routes to achieve stable nanowires, also in the influence of heteroatoms doping to control optical or electronic properties [1]. Usually, the on-surface synthesis approach is adopted due to the robustness and versatile chemistry reactions available [2].

In the present study, we explore the deposition of thiahelicene molecules on Cu(111) as possible candidates for nanowires formation. Sample preparation and measurements were carried out at room temperature in an UHV system and the images were acquired by a non-contact AFM microscope. AFM-micrographic images illustrated the

formation of molecular wires along the monocrystalline terraces. The growth process of the molecular wires retains the three-fold symmetry of the substrate, although, some defect points can be distinguished in their structure. In addition, the high mobility of the molecules indicates a weakly interaction with the copper surface.

[1] B. Mallada et al., ACS Appl. Mater. Interfaces 13, 32393 (2021).

[2] D.Y. Li et al., J. Am. Chem. Soc. 143, 12955 (2021).

O 38.4 Tue 18:00 P2/EG

Fabrication of Kondo Lattice via On-surface Reactions — ●JUNG-CHING LIU¹, RÉMY PAWLAK¹, XING WANG², CHAO LI¹, OUTHMANE CHAHIB¹, PING ZHOU², ROBERT HÄNER², SILVIO DECURTINS², ULRICH ASCHAUER², SHI-XIA LIU², and ERNST MEYER¹ — ¹Department of Physics, University of Basel, Klingelbergstrasse 82, CH-4056 Basel — ²Department of Chemistry and Biochemistry, University of Bern, Freiestrasse 3, CH-3012 Bern

Magnetic atoms assembled in different lattices can exhibit various characteristics, such as spin frustration, heavy fermion, or spin textures via RKKY interaction[1]. Different from scanning probe tip manipulation[2] or e-beam evaporation[3], we perform on-surface reaction to realize magnetic lattice using pyrene-4,5,9,10-tetraone (PTO) and Fe on Ag(111)[4]. The STM and AFM structural investigation at 4K shows 1:1 coordination of PTO and Fe, resulting in 1D chains which further self-assemble into the close-packed pattern. Tunneling spectra measured at 1K confirm Kondo resonance localized on Fe atoms, with moderate dispersion on PTO. The dip lineshape of the Kondo resonance could indicate the spin-1 state on Fe[5]. The successful synthesis of magnetic organometallic structures demonstrates the tunability of Kondo lattice structure by changing molecule species. We believe our work enables fundamental studies of spin-spin and spin-substrate interactions with different spin lattices.[1] Moro-Lagares et al. Nat. Comm. 10, 2211 (2019)[2]Nadj-Perge et al. Science 346[3]Palacio-Morales et al. Sci. Adv. 5, eaav6600 (2019)[4]Pia et al. Chem. Eur. J. 22, 8105-8112 (2016)[5]Li et al. Chem. Commun. 54, 9135-9138 (2018)

O 38.5 Tue 18:00 P2/EG

Growth and structure of *p*-6P thin films as templates for organic heterosystems - a LEEM/PEEM study — ●FRANZ NIKLAS KNOOP, WINFRIED DAUM, and KLAUS STALLBERG — Institute of Energy Research and Physical Technologies, TU Clausthal, Germany

The charge carrier dynamics at the contact of two organic semiconductors are strongly influenced by the molecular and mesoscopic structure of the interface. A systematic study of such structure-related effects on the carrier dynamics requires well defined and controllable model systems. Single-crystalline metals are suitable substrates for the epitaxial growth of well-ordered organic layers, but the carrier dynamics are strongly modified by the presence of a conductive surface. Therefore, we explore a different approach for the formation of organic/organic model systems: rod-like molecules such as paraxiphenyl (*p*-6P) are known to form highly ordered layers on weakly interacting amorphous substrates like SiO₂. These layers are suitable templates for the consecutive epitaxial growth of organic heterostructures. By thermal evaporation under ultrahigh vacuum conditions we deposit *p*-6P films with nominal mono- and bilayer thicknesses on natively oxidized silicon. Characterization with low-energy electron microscopy (LEEM) and atomic force microscopy (AFM) reveals coherent films which comprise single crystalline domains of upright-standing molecules. We discuss the influence of different growth parameters on the film structure and present results from two-photon photoemission electron microscopy (2P-PEEM). Moreover, first results from experiments with organic/organic heterosystems are also presented.

O 38.6 Tue 18:00 P2/EG

Understanding the role of adsorbed CTAB in anisotropic nanostructure growth — ●ESMÉE BERGER¹, NARJES KHOSRAVIAN¹, JOAKIM LÖFGREN², and PAUL ERHART¹ — ¹Department of Physics, Chalmers University of Technology, Gothenburg, Sweden — ²Department of Applied Physics, Aalto University, Espoo, Finland

A crucial step towards improved control over the shapes and sizes of wet-chemically synthesized nanostructures is a detailed theoretical understanding of the growth mechanism's different aspects. One of these

aspects is the adsorption of surfactants, for example cetyltrimethylammonium bromide (CTAB), which is commonly used for structural tuning and increased stability. In water, CTAB exhibits a complex phase diagram, with a number of different liquid crystal-like phases. The complexity of the system is further increased during nanostructure growth, due to the presence of surfaces. Recent studies have indicated that the micellar phase of CTAB is the primary mechanism for anisotropic growth of silica and gold nanoparticles. These results were, however, based on a single value of the CTAB surface density. To properly understand the role of CTAB during anisotropic growth of nanostructures, a surface phase diagram must be established. In this work, we develop an understanding of the surface phase diagram from a modeling perspective, by means of molecular dynamics simulations.

O 38.7 Tue 18:00 P2/EG

Implementation of a silicon wafer into an UHV STM system for low temperature molecular depositions — ●KEN KOLAR, GRANT SIMPSON, CHRISTOPHE NACCI, and LEONHARD GRILL — Uni Graz, Graz, Austria

Sublimation temperatures of organic molecules typically rise as the number of constituting atoms is increased. This can lead to fragmentation and other experimental difficulties during molecular deposition if a standard sublimation Knudsen cell is used. One of the possibilities to overcome this problem is the deposition of molecules using the "energy sudden" sublimation from a silicon wafer. We have installed such a system in our ultrahigh vacuum chamber and used it for depositions onto the sample that is kept at cryogenic temperatures during the preparation. Here, we present how such a device was implemented in our setup, together with first scanning tunneling microscopy (STM) images of the test depositions.