

## O 114: Nanostructures at surfaces: 1D and 2D structures and networks IV

Time: Friday 10:30–11:30

Location: MA 141

O 114.1 Fri 10:30 MA 141

**Terminal Alkyne Coupling on a Corrugated Noble Metal Surface: From Controlled Precursor Alignment to Selective Reactions** — •TAO LIN<sup>1</sup>, LIDING ZHANG<sup>1</sup>, JONAS BÖRK<sup>2</sup>, ZHI CHEN<sup>3</sup>, MARIO RUBEN<sup>3,4</sup>, JOHANNES BARTH<sup>1</sup>, and FLORIAN KLAPPENBERGER<sup>1</sup> — <sup>1</sup>Physik-Department E20, Technische Universität München James-Frank-Str., 85748 Garching (Germany) — <sup>2</sup>Department of Physics, Chemistry, and Biology (IFM), Linköping University 58183 Linköping (Sweden) — <sup>3</sup>Institute of Nanotechnology, Karlsruhe Institute of Technology 76344 Eggenstein-Leopoldshafen (Germany) — <sup>4</sup>IPCMS-CNRS University de Strasbourg 23 Rue de Loess, 67034 Strasbourg (France)

Surface-templated covalent coupling of organic precursors currently emerges as a promising route to the atom-precise fabrication of low-dimensional carbon materials. Here, we investigate the adsorption and coupling reactions of 4,4"-diethynyl-1,1':4',1"-terphenyl on Au(110) under UHV conditions by using scanning tunneling microscopy combined with density functional theory and kinetic Monte Carlo calculations[1]. Annealing induces both 1,2,4 asymmetric cyclotrimerization and homo-coupling, resulting in various reaction products including a previously unreported, surface-templated H-shaped pentamer. Further Analysis of the temperature dependent relative product abundances unravels that 1,2,4-trimerization and homocoupling proceed via identical intermediate species with final products depending on the competition of coupling to a third monomer vs. dehydrogenation. [1] Lin et al., Chem. Eur. J. 2017, 23, 15588.

O 114.2 Fri 10:45 MA 141

**Assembly of robust holmium-directed 2D metal-organic coordination complexes and networks on the Ag(100) surface and on epitaxial MgO/Ag(100) layers** — •MARTIN UPHOFF<sup>1</sup>, RAPHAEL HELLWIG<sup>1</sup>, GEORG MICHELITSCH<sup>2</sup>, KARSTEN REUTER<sup>2</sup>, HARALD BRUNE<sup>3</sup>, FLORIAN KLAPPENBERGER<sup>1</sup>, and JOHANNES V. BARTH<sup>1</sup> — <sup>1</sup>Physics Department, TUM, Munich, Germany — <sup>2</sup>Faculty of Chemistry, TUM, Munich, Germany — <sup>3</sup>Institute of Physics, EPFL, Lausanne, Switzerland

We report the fabrication of novel lanthanide-directed metal-organic coordination networks (MOCNs) and complexes under UHV conditions on a clean Ag(100) surface. Utilizing STM we investigate the assembly behavior of single holmium atoms as coordination centers and 1,4-benzenedicarboxylic acid (TPA) as molecular linkers. The step-wise fabrication of the structures, as well as an organic precursor phase is described in detail. We observe two different phases of holmium-based metal-organic architectures. MOCNs as well as Ho-directed metal organic complexes can be fabricated and structural models are developed and confirmed by DFT calculations. The contributions of metal-ligand interactions, hydrogen bondings between adsorbed molecules and the role of molecule substrate interaction is analyzed. Furthermore, the metal-organic layers could be realized on magnesium oxide on Ag(100) to screen them from electronic influences of the metal surface. MgO

monolayers of unprecedented quality allow the fabrication of metal-organic structures, which are similar to those on the bare silver in terms of their binding motifs and stoichiometry.

O 114.3 Fri 11:00 MA 141

**On-surface transmetalation of porphyrins** — DIANA HÖTGER<sup>1</sup>, •MARKUS ETZKORN<sup>1,2</sup>, CLAUDIUS MORCHUTT<sup>1</sup>, PATRICK ALEXA<sup>1</sup>, DORIS GRUMELLI<sup>3</sup>, JAN DREISER<sup>4</sup>, HERIBERTO FABIO BUSNENGO<sup>5</sup>, PAULA ABUFAGER<sup>5</sup>, SEBASTIAN STEPANOW<sup>6</sup>, RICO GUTZLER<sup>1</sup>, and KLAUS KERN<sup>1,7</sup> — <sup>1</sup>Max Planck Institut für Festkörperforschung, Stuttgart, Germany — <sup>2</sup>Institut für Angewandte Physik, Technische Universität Braunschweig, Germany — <sup>3</sup>Universidad Nacional de La Plata, Argentina — <sup>4</sup>Paul Scherrer Institute, Swiss Light Source, Villigen, Switzerland — <sup>5</sup>Instituto de Física, Rosario, Argentina — <sup>6</sup>Swiss Federal Institute of Technology Zurich, Switzerland — <sup>7</sup>Institut de Physique, Ecole Polytechnique Fédérale de Lausanne, Switzerland

We have investigated the transmetalation of metal porphyrin monolayer networks self-assembled on Au(111) using X-ray absorption, scanning tunneling microscopy and DFT studies. In the X-ray absorption the coordinated metal centers show the expected clear multiplet structure as a result of the ligand field. When depositing Co on the networks formed by Fe-porphyrins at room temperature, we find strong evidence of an efficient metal cation exchange in the spectra. The Co absorption spectra now show a clear multiplet structure similar to the one of Co-porphyrins while the Fe spectra become much more metallic in character. The process is unidirectional as we find no signs of transmetalation for Fe deposited on Co-porphyrins. We have also observed similar signatures of transmetalation for Cu-porphyrins when depositing Co. The latter finding illustrates the differences to transmetalation in solution.

O 114.4 Fri 11:15 MA 141

**Investigation of stepwise crosslinked 4-terphenylthiol self-assembled monolayers** — •PATRICK STOHMANN, SASCHA KOCH, YANG YANG, CHRISTOPHER DAVID KAISER, and ARMIN GÖLZHAUSER — Department of Physics, University of Bielefeld, Universitätsstraße 25, 33615 Bielefeld, Germany

When aromatic self-assembled monolayers (SAMs) are electron-irradiated, intermolecular crosslinking leads to the formation of Carbon Nano Membranes (CNM) with molecular thickness [1]. The present investigation focuses on the structural transformation from a pristine 4-terphenylthiol (TPT) SAM on Au(111), comparable to previous experiments [2], to a fully crosslinked molecular film, induced by a step-wise increase of the 50 eV electron irradiation dose. The amorphism of the respective partially crosslinked films is investigated by means of scanning tunneling microscopy (STM) at UHV conditions. Electron-induced chemical modifications of the molecular layer and the layer-gold interface as well as the change in the molecular order are investigated by X-ray photoelectron spectroscopy (XPS) and low energy electron diffraction (LEED), respectively.