

JUNG², LUTZ H. GADE³, and MEIKE STÖHR¹ — ¹Institute of Physics, University of Basel, Switzerland — ²Paul-Scherrer-Institute, Switzerland — ³Institute of Inorganic Chemistry, University of Heidelberg, Germany

Self-assembly of molecules on surfaces directed by supramolecular interactions has been widely explored. The perylene derivative (DPDI) we analyzed [1] is modified on the surface in order to achieve self-assemblies. This modification is temperature-induced, thus providing an additional feature to the control of self-assemblies in contrast to usual approaches that make use of molecular properties already inherent to the molecules. Thin films of DPDI were prepared on Cu(111) and investigated with STM. Depending on the coverage before annealing, three different H-bond assemblies are generated, since in a thermally induced reaction the end groups of the molecule are modified and it can then act as both a H-bond donor and acceptor. For a similar perylene derivative (TAPP), an open quadratic assembly is found on Cu(111), which is not based on temperature-induced modification. If both molecules are present on the surface and the sample is annealed, a separation into two porous networks is observed.

[1] M. Stöhr et al., *Angew. Chem. Int. Ed.*, 2005, 44, 7394

O 39.8 Wed 17:30 H36

Self-Assembly of Metal-Organic Coordination Networks at Surfaces with Scalable Nanocavity Size and Aspect Ratio — ●ALEXANDER LANGNER¹, STEVEN L. TAIT¹, CHANDRASEKAR RAJADURAI², NIAN LIN¹, MARIO RUBEN², and KLAUS KERN¹ — ¹Max-Planck-Institut für Festkörperforschung, Stuttgart — ²Institut für Nanotechnologie, Forschungszentrum Karlsruhe

We report on the rational use of two-dimensional supramolecular self-assembly as efficient bottom-up method for nanoscale patterning of metal surfaces. The controlled self-organization of multi-ligand systems by metal-organic coordination is investigated on Cu(100) under ultra high vacuum (UHV) conditions with scanning tunneling microscopy (STM). Mixtures of dicarboxyl and bipyridyl molecules with vapor deposited iron atoms assemble into arrays of coordination nodes, each consisting of 2 molecules of each functional group termination, coordinated in a cross geometry to a di-iron center. This directional and selective coordination produces ordered rectangular networks in which the size and the aspect ratio of the cavities can be scaled by varying the backbone length of the different linker molecules independently. Investigation of these model systems also gives insight into fundamental properties of self-assembly such as self-recognition or error correction.

O 40: Particles and Clusters I

Time: Wednesday 15:45–17:15

Location: H38

O 40.1 Wed 15:45 H38

Surface strain of Au clusters analysed by transmission electron holography — ●RADIAN POPESCU¹, ERICH MÜLLER¹, DAGMAR GERTHSEN¹, MATTHIAS WANNER^{1,2}, MARCO SCHOWALTER³, ANDREAS ROSENAUER³, ARTHUR BÖTTCHER⁴, and MANFRED KAPPES⁴ — ¹Laboratorium für Elektronenmikroskopie and Center for Functional Nanostructures, Universität Karlsruhe, D-76128 Karlsruhe, Germany — ²Forschungsinstitut für Pigmente und Lacke e.V., D-70569 Stuttgart, Germany — ³Institut für Festkörperphysik, Universität Bremen, D-28359 Bremen, Germany — ⁴Institut für Physikalische Chemie, Universität Karlsruhe, D-76128 Karlsruhe, Germany

We have carried out an accurate quantitative analysis of the dependence of the mean inner Coulomb potential (MIP) on the particles thickness for Au nano-clusters deposited on amorphous carbon (a-C) substrate taking into account the strain relaxation of the cluster surface atoms. It was shown that the high experimental cluster MIP values of about 80 V measured for the 0.5 nm Au clusters radii can be accounted for only by the strain of the surface atoms. The MIP value of Au volume atoms (atoms which have the Au-bulk coordination number) of $V=32.1\pm 3.6$ V we have derived, is in good agreement with previous theoretical estimations of the Au bulk MIP values. The theoretical method developed here to calculate the MIP is not only applicable to the special case of Au clusters, but can be extended to any type of metallic materials.

O 40.2 Wed 16:00 H38

Nanosecond and femtosecond laser photodesorption of NO from silver nanoparticles on a thin alumina film — ●KI HYUN KIM¹, DANIEL MULUGETA¹, KAZUO WATANABE¹, DIETRICH MENZEL^{1,2}, and HANS-JOACHIM FREUND¹ — ¹Fritz-Haber-Institut der Max-Planck-Gesellschaft, Faradayweg 4-6, 14195 Berlin, Germany — ²Technische Universität München, 85747 Garching, Germany

Nanosecond (ns) and femtosecond (fs) laser photodesorption (PD) of NO adsorbed on Ag nanoparticles supported on a thin Al₂O₃ film has been studied by a mass selected time-of-flight method (MS-TOF) and by temperature programmed desorption. NO was adsorbed on 0.5-nm deposited Ag nanoparticles (~8 nm particle diameter) at 75 K, resulting in the formation of NO dimers. PD cross sections were calculated from the irradiance dependence of the total PD yield of NO fitted to a single exponential. With ns pulses (~5 ns) at $h\nu=3.5$ eV in p-polarization, a PD cross section of 5.6×10^{-17} cm², which is about 30 times larger than that on Ag(111), was obtained. Also, the NO mean translational energy (670 K) is larger than in that case. The enhancement is explained by resonant excitation of the Mie plasmon of the Ag nanoparticles at 3.6 eV.

With fs pulses (~100 fs) at $h\nu=3.1$ eV in p-polarization, off-resonant from the Mie plasmon, a PD cross section of 2.3×10^{-16} cm² was ob-

tained. The mean translational energy of NO was 540 K. The PD yield was proportional to the ~1.7th power of the laser fluence. A two-photon excitation process or a DIMET (desorption induced by multiple electronic transitions) may be involved in the PD with fs pulses.

O 40.3 Wed 16:15 H38

In Situ Surface Enhanced Infrared Absorption Spectroscopy for the Analysis of the Adsorption and Desorption Process of Au Nanoparticles on the SiO₂/Si Surface — ●DOMINIK ENDERS^{1,2}, TADAAKI NAGAO^{1,2}, and TOMONOBU NAKAYAMA^{1,2} — ¹National Institute for Materials Science (NIMS), 1-1 Namiki, Tsukuba 305-0044, Japan — ²Nanoscale Quantum Conductor Array Project, ICORP, JST, 4-1-8 Honcho, Kawaguchi, Saitama 332-0012, Japan

The adsorption and desorption of Au nanoparticles (AuNP) in colloidal D₂O suspension on the SiO₂/Si surface was investigated by in situ ATR-IR spectroscopy. With increasing surface density of AuNP the absorption of the vibrational modes of D₂O and of the citrate molecules covering the AuNP increases due to surface enhanced infrared absorption (SEIRA). We show that the adsorption kinetics can be investigated by monitoring the molecular vibrational modes of D₂O and the citrate molecules, and furthermore we clarify that the adsorption process can be described very well by a Langmuir-kinetics model. When exposing a saturated AuNP submonolayer to 2-aminoethanethiol/D₂O solution, the AuNP are removed from the surface and the IR absorption of the D₂O vibrational modes become weaker again. Taking into account the time dependencies of the CH and the OD peaks, we propose a microscopic model explaining the mechanism of the desorption process.

O 40.4 Wed 16:30 H38

Dealloying effects in rotating CuAu nanoclusters - A molecular dynamics study — ●H. NEUBAUER and S.G. MAYR — I. Physikalisches Institut, Georg-August-Universität Göttingen, Friedrich-Hund-Platz 1, 37077 Göttingen

Dealloying effects in rotating liquid CuAu clusters are investigated with the help of classical molecular dynamics simulations using embedded atom method (EAM) potentials. We employ the model system, CuAu, to investigate the phenomenon as a function of cluster size and composition, i.e. for CuAu, Cu₃Au and CuAu₃. In addition to well-established surface energy related effects, we find an enrichment of Au on the surface due to centrifugal forces. An ellipsoid deformation of the cluster occurs, while Au forms a bulge around the rotating cluster. Disturbances occurring during rotational movement, such as thermal fluctuations or oscillations, are found to counteract the dealloying process by mixing the constituents; for long enough times a stationary