



Vortragsankündigung

Donnerstag, den 22. Juni 2017, 17.15 h
Hörsaal III, Physik-Department, Garching

High resolution imaging of individual macromolecules and their assemblies via preparative mass spectrometry

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Abstract:

Measuring, understanding, and eventually controlling the complexity that arises when synthetic or natural, molecular nanostructures interact with their environment are the current challenges of nanoscale science and technology. High-resolution microscopy methods such as scanning probe microscopy or electron microscopy have the capacity to investigate nanoscale systems with ultimate precision, for which atomic scale precise preparation methods of surface science are a necessity. Often however, ultrahigh vacuum surface science and biological molecules are incompatible. Preparative mass spectrometry with soft ionization sources like electrospray ionization has the capacity to serve as a link between the worlds of large, biological molecules and surface science, enabling atomic scale chemical control of molecular deposition in ultrahigh vacuum. In this talk I introduce the combined experiments electrospray ion beam deposition and scanning tunneling microscopy and point out the special challenges of preparative mass spectrometry for surface science. Our results show that this methodology offers a highly controlled and pure path to high resolution microscopy with unique features of the deposition due to the use of charged polyatomic particles. This new field is an enormous sandbox for researching novel, sequence controlled molecular materials and opens the possibility of targeted single molecule imaging of large, individual molecules, not only by scanning probe methods.

- (1) S. Rauschenbach, F. L. Stadler, E. Lunedei, N. Malinowski, S. Koltsov, G. Costantini and K. Kern: *Electrospray Ion Beam Deposition of Clusters and Biomolecules*. **Small** 2 (2006) 540-547
- (2) S. Rauschenbach, R. Vogelgesang, N. Malinowski, J. W. Gerlach, M. Benyoucef, G. Costantini, Z. Deng, N. Thontasen and K. Kern: *Electrospray Ion Beam Deposition: Soft-Landing and Fragmentation of Functional Molecules at Solid Surfaces*. **ACS Nano** 3 (2009) 2901-2910
- (3) Z. Deng, N. Thontasen, N. Malinowski, G. Rinke, L. Harnau, S. Rauschenbach and K. Kern: *A Close Look at Proteins: Submolecular Resolution of Two- and Three-Dimensionally Folded Cytochrome c at Surfaces*. **Nano Lett.** 12 (2012) 2452-2458
- (4) S. Kahle, Z. Deng, N. Malinowski, C. Tonnoir, A. Forment-Aliaga, N. Thontasen, G. Rinke, D. Le, V. Turkowski, T. S. Rahman, S. Rauschenbach, M. Ternes and K. Kern: *The Quantum Magnetism of Individual Manganese-12-Acetate Molecular Magnets Anchored at Surfaces*. **Nano Lett.** 12 (2012) 518-521
- (5) S. Rauschenbach, G. Rinke, N. Malinowski, R. T. Weitz, R. Dinnebie, N. Thontasen, Z. Deng, T. Lutz, P. M. de Almeida Rollo, G. Costantini, L. Harnau and K. Kern: *Crystalline Inverted Membranes Grown on Surfaces by Electrospray Ion Beam Deposition in Vacuum*. **Adv. Mater.** 24 (2012) 2761-2767
- (6) G. Rinke, S. Rauschenbach, L. Harnau, A. Albarghash, M. Pauly and K. Kern: *Active Control of Protein Conformation on Metals by Hyperthermal Surface Interaction*. **Nanoletters** 14, 5609-5615 (2014)

There will be coffee, tea, and cookies in front of the lecture hall at 17.00 h