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speaks

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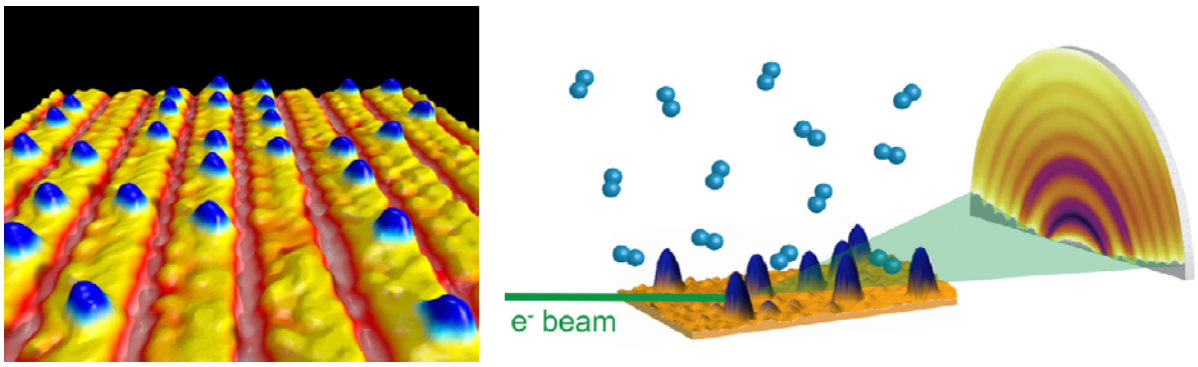
about

Excitations and Reactions in Low-Dimensional Metals

Low-dimensional metals prepared on semiconductor surfaces act as a fascinating playground for fundamental and chemical physics. Their controlled manipulation via doping, charge injection, photon excitation, and chemical treatment is among our research aims. In this contribution two classes of systems are introduced and discussed: (i) quasi one-dimensional atomic wires prepared by self-assembly [1], and (ii) size-selected metal particles deposited under soft-landing conditions [2]. Scanning tunneling microscopy (STM) enables precise mapping of excited low-dimensional matter, either created by photon irradiation [3] or locally by charge injection [4]. An example for the latter is the atomic wire system Si(553)-Au where a temporarily excited phase results in rapid fluctuations of the STM topography due to a competition between excitation and decay. In the case of metal nanoparticles structural transitions can be efficiently tailored by varying the chemical environment [2]. Electron scattering is used for tracking such phase transitions *in-situ* and quantifying their reaction kinetics, uncovering a surprising evolution of effective activation energies with particle size. Different reactions turn out to be selectively sensitive to the detailed inner morphology of the particles, rather than just to their size [5].



Left: scanning tunneling microscopy image of atomic chains on Si(111)-(5x2)-Au.
Right: electron diffraction in transmission through metal particles deposited on silicon.

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[2] S. Bartling *et al.*, ACS Nano **9**, 5984 (2015).

[3] K. Sell, I. Barke, S. Polei, C. Schumann, V. v. Oeynhausen, and K.-H. Meiwes-Broer, Phys. Stat. Sol. (b) **247**, 1087 (2010).

[4] S. Polei, P.C. Snijders, S.C. Erwin, F.J. Himpsel, K.-H. Meiwes-Broer, and I. Barke, Phys. Rev. Lett. **111**, 156801 (2013).

[5] S. Bartling, M.-M. Pohl, K.-H. Meiwes-Broer, and I. Barke, J. Chem. Phys. **143** (2015), *accepted*.

All interested persons are cordially invited.
Gez. Prof. Dr. Niklas Nilius