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Einladung zum Vortrag

Manipulating atoms with an electron beam

von

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Ort: **Ludwig-Boltzmann-Hörsaal**
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Abstract:

Scanning transmission electron microscopy (STEM) can reveal the chemical structure of materials down to the atomic level, and is rapidly emerging as a fundamentally new tool for the direct assembly of nanostructures. Atom manipulation in the STEM relies on momentum transfer from the highly energetic electrons, which can lead to atom ejection [1] but may also induce interesting dynamics when the transferable kinetic energies are comparable to bond strengths in the material [2]. Operating in this regime, our recent experiments have revealed the potential for single-atom manipulation of Si heteroatoms in the graphene lattice using the Ångström-sized electron beam of our aberration-corrected Nion UltraSTEM [3]. In the latest experiments, we have achieved dozens of controlled single-site jumps with a manipulation rate already comparable to state-of-the-art in fully automated scanning tunneling microscopy [4]. Sample quality thus appears to be the principal challenge in creating 2D nanostructures from multiple Si atoms in the near future [5], and both other elements [6] and other materials also appear possible [7]. Many new possibilities in fundamental materials science and nanotechnology will be within our reach once the full power of this technique is harnessed.

[1] T. Susi *et al.*, Nat. Commun. 7:13040 (2016)
[2] T. Susi *et al.*, Phys. Rev. Lett. 113, 115501 (2014)
[3] T. Susi *et al.*, Ultramicroscopy 180, 163-172 (2017)
[4] M. Tripathi *et al.*, Nano Letters 18, 5319 (2018)
[5] D. Nosraty Alamdary et al., Physica Status Solidi B, 1700188 (2017)
[6] T. Susi *et al.*, 2D Materials 4, 042004 (2017)
[7] B.M. Hudak *et al.*, ACS Nano 12, 5873 (2018)