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Einladung zum Physikalischen Kolloquium

Montag, 19.11.2018
16:15 Uhr in N24/H13

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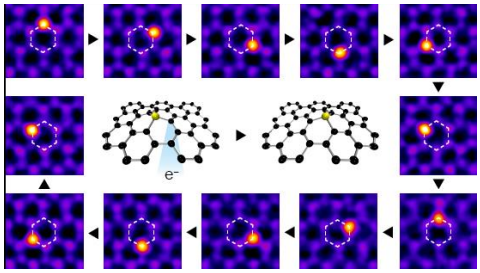
Electron-beam manipulation of single impurity atoms in graphene

Scanning transmission electron microscopy (STEM) is a powerful tool for studying materials down to their atomic structure, and mechanically robust and electrically conducting graphene is an ideal sample. In an effort to control its properties, heteroatom dopants have been introduced into graphene both during growth and using post-growth methods, with ion implantation being a particularly promising example of the latter technique. Recent advances in aberration-corrected STEM and electron energy loss spectroscopy (EELS), combined with ab initio spectrum simulations, have allowed the identity and bonding of individual atoms to be determined, including recently implanted phosphorus [1].

STEM is further emerging as fundamentally new tool for the direct assembly of nanostructures. Atomically precise manipulation relies on advances in instrumentation that have enabled non-destructive atomic-resolution imaging at lower electron energies. While momentum transfer from highly energetic electrons often leads to atom ejection, interesting dynamics can be induced when the transferable kinetic energies are comparable to bond strengths in the material [2]. Operating in this regime, very recent experiments have revealed the potential for single-atom manipulation of Si heteroatoms in the graphene lattice using the Ångström-sized electron beam [3].

In our 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 other elements also appear possible [6].

[1] T. Susi et al., 2D Materials 4, 021013 (2017)
[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)



Ab 16.00 Uhr Kaffee, Tee und Kekse vor dem Hörsaal H13
Organisation: **Prof. Dr. F. Jelezko, Tel. 23750**
Host: **Prof. Dr. U. Kaiser, Tel. 22950, off.: 22951**