

DS 9 Elektronische Eigenschaften von Oberflächen

Zeit: Samstag 09:00–09:45

Raum: TU EB301

Hauptvortrag

DS 9.1 Sa 09:00 TU EB301

Low-dimensional electrons at silicon surfaces — •FRANZ J. HIMPSEL — Physics Dept., University of Wisconsin Madison, 1150 University Ave., Madison, WI 53706, USA

It has become possible to create a class of low-dimensional chain structures on silicon surfaces that are metallic [1,2]. Electrons near the Fermi level are de-coupled from the substrate because their energy lies in the band gap. The metal atoms, however, are rigidly tied to the silicon lattice in substitutional positions according to x-ray diffraction [3] and first principles band calculations [4]. The dimensionality can be controlled by using stepped surfaces with adjustable step spacing. Ratios of the intra-chain coupling to the inter-chain coupling between 10:1 and more than 70:1 have been achieved. In addition, the band filling can be varied, including fractional fillings, such as $8/3$ of an electron per chain atom [2]. That creates an opportunity to systematically search the parameter space for exotic states predicted for one-dimensional electrons, such as a collective excitation where spin and charge separate. This wide-open territory of low-dimensional structures is explored in real and reciprocal space by scanning tunneling microscopy and angle-resolved photoemission. [1] Himpfel et al., J. Phys. Condens. Matter 13, 11097 (2001). [2] Crain et al., Phys Rev. Lett. 90, 176805 (2003) and Phys. Rev. B 69, 125409 (2004). [3] Robinson et al., Phys. Rev. Lett. 88, 096104 (2002). [4] Sanchez-Portal et al., Phys. Rev. B 65, 081401 (2002) and Phys. Rev. Lett. 93, 146803 (2004); Erwin, Phys. Rev. Lett. 91, 206101 (2003).