TECHNISCHE UNIVERSITÄT CHEMNITZ

PHYSIKALISCHES KOLLOQUIUM

Mittwoch, 20.06.2012, um **17:15 Uhr**

Ort: Reichenhainer Str. 90; Neues Hörsaalgebäude, Raum: 2/N013

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Band Structure and Spin-phenomena in Carbon Nanotubes

Carbon nanotubes are highly tunable, quasi-one-dimensional solids with an extraordinary rich spectrum of possibilities both for applications and for fundamental experiments. The magneto-conductance of an open carbon nanotube (CNT)-quantum wire was measured in very high magnetic fields up to 60 T orientated parallel to the tubes. At low temperatures we find a peculiar split magneto-conductance peak close to the charge neutrality point. Our analysis of the data reveals that this splitting is intimately connected to the spin-orbit interaction and the tube chirality. Band structure calculations suggest that the current in the peak regions is highly spin-polarized, which calls for application in future CNT-based spintronic devices [1].

The magnetoconductance of a thick semiconducting carbon nanotube revealed a band-gap closure and the reopening of the gap under variation of an axial magnetic field [2]. This observation verifies a long-standing theoretical prediction that the band gap closure occurs near a magnetic flux enclosed by the tube of $h/3e$ and $2h/3e$ .We find also noticeable influence of mechanical strain on the magnetoconductance of the CNTs.

In a second set of experiments we investigate the Kondo-Effect in CNT quantum dots with ferromagnetic PdNi contacts [3]. We observe a zero-field splitting of the Kondo resonance, with can be compensated by an external magnetic field B_C. The splitting can be viewed as an exchange interaction between an un-paired spin on the quantum dot, and the magnetically polarized electron system in the leads. The data are well explained by a simple model, and show a remarkable universality in the vicinity of the compensation field B_C.

[1] S. H. Jhang, et al., Phys. Rev. B **82**, 041404 (2010)
[2] S. H. Jhang, et al., Phys. Rev. Lett. **106**, 096802 (2011)
[3] M. Gaass, et al., Phys. Rev. Lett. **107**, 176808 (2011)

Alle Zuhörer sind ab 17.00 zum Kaffee vor dem Hörsaal eingeladen.

Informationen zum Vortrag erteilen Prof. Dr. Salvan, Prof. Dr. Zahn Tel. 0371/531 33137,33036