Electron transport in bundles of metallic single-walled carbon nanotubes **PTU 53**

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Electron transport in individual metallic single-walled carbon nanotube (SWNT) has been described within a Luttinger liquid model (LL) which can explain the power law behaviour found in the temperature dependent conductance, as well as in the voltage dependent differential conduc-tance [1]. In heterogeneous bundles of SWNTs, that are composites of metallic and semiconducting tubes, similar power law behaviour has been observed [2], which implies, that the metallic tubes in a heteroge-neous bundle are well decoupled from each other by the semiconducting nanotube matrix.
During the fabrication of carbon nanotubes both metallic and semicon-ducting ones are produced. Using dielectrophoresis as a method to separate these types [3], we are able to prepare samples of bundles of exclusively metallic SWNTs, i.e. without the semiconducting nanotube matrix. In this configuration, the SWNTs are still surrounded by the sur-factant that is necessary for the separation process.
On such samples we measure the transport characteristics and antici-pate a deviation from the LL behaviour due to enhanced intertube cou-pling. To enforce the coupling, we anneal the samples assuming that in this manner, the amount of surfactant in-between the tubes is abated and the tube-tube distance is reduced.

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[2] R. Krupke et al., Nano Lett. 3 (2003) 1019
[3] R. Krupke et al., Science 301 (2003) 344

Anisotropic dielectric response and local field effects in SWCNT **PTU 54**

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SWCNT are archetypical 1D systems, with peculiar anisotropic electronic properties. The depolarization effects concomitant with dielectric screening of electronic transitions are crucial in optical probes like Raman, optical absorption and luminescence. Only recently ?m thick freestanding films of vertically aligned SWCNT became available and were characterized regarding the polarization dependent optical response[1]. The plasmon response in electron energy loss spectroscopy is a direct access to the full energy and momentum dependent dielectric function. The full plasmon dispersion allows distinguishing between the effective dielectric screening and depolarization effects. The sparse morphology of the aligned freestanding mats gives rise to a substantial increase in local field corrections as compared to earlier studies on bulk aligned SWCNT[2]. The aligned nature of the SWCNT mats allows realizing experimental scattering geometries selecting specific momentum transfers parallel and normal to the axis of the SWCNT. We find two distinct branches in the ? and ? plasmon, respectively. Varying the effective transverse and parallel momentum transfer conclusively identifies the dispersive branches as parallel and non dispersive branches as perpendicular with respect to the SWCNT axis. These novel findings provide an unprecedented experimental insight into local field effects in strongly anisotropic electronic systems.

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