TECHNISCHE UNIVERSITÄT CHEMNITZ

Institut für Physik
Physikalisches Kolloquium

Mittwoch, 23.01.2019, um 16:00 Uhr

Ort: Reichenhainer Str. 90;
Zentrales Hörsaal- und Seminargebäude,
Raum 2/N013

PD Dr. Martin Wenderoth

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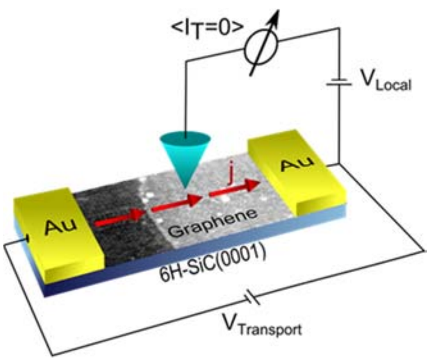
Transport in epitaxial graphene on the nanoscale

The transport properties of epitaxial graphene have been subject of intense theoretical and experimental investigations since its invention. Besides electron-electron and electron-phonon scattering, the charge transport is determined by structural defects such as impurities, substrate steps or monolayer/bilayer junctions. The latter are leading to a spatially varying potential landscape as well as an inhomogeneous current density. Scanning Tunneling Microscopy combined with a potentiometric extension, called Scanning Tunneling Potentiometry (STP), has opened a way to study these transport properties down to the nanometer scale. Using an STP setup based on a home-built low-temperature STM operating down to 6 K and applicable magnetic field of up to 6T, we have investigated the sheet resistance of graphene focusing on charge transport across different localized defects on a sub-nanometer scale. We find that the voltage drop at a monolayer-bilayer boundary in graphene clearly extends spatially up to a few nanometers into the bilayer and hence is not located strictly at the structural defect. We explain this behavior by the weak coupling between the two bilayer sheets. From magneto-transport STP measurements mapping the local electrochemical potential as a function of the applied magnetic field, we have extracted the local charge carrier concentration by the emerging Hall field. Additionally, we show that the defect resistance at local defects such as steps, wrinkles and ML/BL-junctions remains constant for all magnetic fields applied here.



To determine local resistances quantitatively, the local driving field as well as the local current density are needed. While STP is measuring the local chemical potential with high precision, the local current density is a priory unknown. In all STP studies up to now, the local current density is replaced by an averaged value, e.g. given by the total current and the geometry of the sample. Graphene grown on 6H-silicon carbide (0001) prepared by polymer assisted sublimation growth (PASG) are characterized by a high degree of a spatial homogeneity. This allows analyzing transport properties quantitatively on the nanometer scale. We demonstrate this new possibility by determining the sheet resistance as a function of the stacking sequence of 6H-SiC. At 8 Kelvin, highly resolved STP measurements show a significant variation of up to 240% demonstrating the strong influenced of the underlying substrate on a local scale.

Alle Zuhörer sind ab 15:45 zu Kaffee und Tee vor dem Hörsaal eingeladen.

Informationen zum Vortrag erteilt:
Prof. Dr. Thomas Seyller, Tel. 0371 531 32898

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