Aachen Graphene & 2D Materials Center

2D Materials and Quantum Device Group | RWTH AACHEN UNIVERSITY

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Bachelorarbeit:
Stability and transfer of domains of tetralayer graphene

Motivation: Few-layer graphene samples consist of two-dimensional sheets of carbon atoms arranged in a hexagonal lattice (i.e. several graphene sheets), which are stacked on top of each other. Whereas graphene itself is semi-metallic with a linear dispersion around the Fermi energy, in few-layer graphene the electronic structure depends strongly on the stacking order. Some stacking orders show very interesting properties, ranging from the emergence of superconductivity to correlated states of matter. Some stacking orders are energetically less stable than others and can therefore easily relax to a different configuration. In order to investigate these less stable stackings in transport or STM measurements, they need to survive a number of processes, from encapsulation in hBN layers to the evaporation of metal contacts etc. Here, the idea is to study processes, which make even small domains available for further characterization using the advanced measurement setups in our lab.

Goal of the thesis: The goal of this thesis is to investigate the stability of few-layer stacking orders for later transport or STM measurements under common preparation techniques. In particular, a temperature dependence of the stability and the successful encapsulation of the domains are supposed to be investigated.

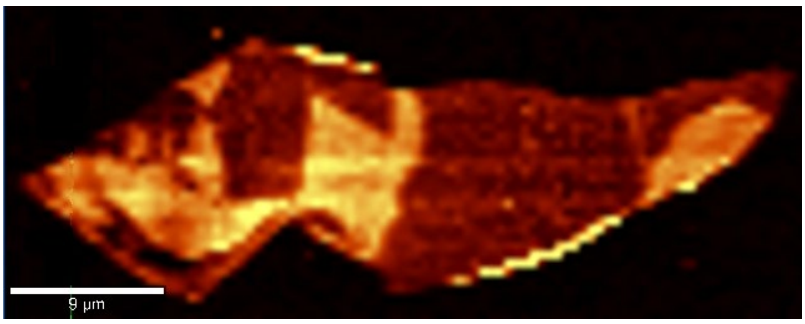

Fig 1 a) Raman image of a trilayer graphene flake, showing ABC and ABA stacked areas

Your tasks: Your task will consist of the exfoliation of few-layer graphene samples and the characterization of their local stacking order using confocal Raman spectroscopy. You will use our sophisticated transfer system to create heterostacks of few-layer graphene and hexagonal boron nitride. You will also be able to expand your knowledge in the following topics:

- Working with state-of-the-art manufacturing technologies in cleanroom research facilities
- Consolidation of your knowledge about the fundamental physics of electronic bandstructures, 2D materials and correlation effects. You will also take part in group seminars and journal clubs to discuss current developments in this field of research.

Contact: For further information and interest please contact Lutz Waldecker (waldecker@physik.rwth-aachen.de), Alexander Rothstein (rothstein@rwth-aachen.de). You can also find information on our work at www.stampferlab.org and www.graphene.ac.