

S E M I N A R
aus
Halbleiterphysik und Nanotechnologie

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**“Scanning Probe Microscopic and Spectroscopic
Investigations of Graphene”**

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Graphene synthesized by various techniques has different properties, which set a range of potential applications for a specific type of graphene. Here we give an overview of three different techniques for fabrication of graphene-based thin films: micromechanical exfoliation, wet transfer of chemical vapor deposited (CVD) graphene, and Langmuir-Blodgett assembly from non-covalent liquid phase exfoliated graphene. We employ various scanning probe microscopy and optical spectroscopy techniques to determine how these different fabrication processes affect properties of the resulting films, and present advantages and drawbacks for various applications.

We investigate optical properties of exfoliated and CVD graphene in the visible and ultraviolet ranges using spectroscopic ellipsometry, focusing on how these are altered by the interaction with an ambient [1], or various dielectric and metallic substrates [2], or by different fabrication processes [3]. In particular, we highlight how transfer residue and sample annealing affect optical properties of CVD graphene [3], as well as how the interaction between graphene and a gold substrate can be observed through spectroscopic ellipsometry and Kelvin probe force microscopy [2]. Furthermore, we compare solution-processed graphene films with those obtained by more elaborate fabrication techniques as CVD and exfoliation. In order to enhance properties of these solution-processed films, and to approach the quality standards set by CVD graphene, we employ chemical doping with nitric acid [4]. In addition, we compare growth morphologies of parahexaphenyl on exfoliated and CVD graphene [5-7], and use Kelvin Probe Force Microscopy to investigate shifts in the work function of parahexaphenyl on exfoliated graphene tuned by the electric field effect.

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