

Ellipsometric Micromapping of Graphene grown on Copper-foil

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The demand of high quality graphene e.g. for electronic applications raised the necessity for the direct growth of Graphene on Cu-foils [1]. To investigate the layer structure and coverage of Graphene, conventional methods are SEM or optical microscopy after oxidizing the foil. SEM requires high vacuum and is not suitable for the detection of defects, layer number and uniformity on large areas. To investigate Graphene with optical microscopy the foil either needs to be oxidized, hence destroyed, or the Graphene needs to be transferred to suitable substrates, e.g. Si/SiO₂.

In the talk we present, imaging ellipsometry is able to characterize the Graphene directly grown on the foil. Besides the plethora of optical properties, the combination of microscopy and ellipsometry reveals foldings of the Graphene on the Copper-foil. These foldings are induced by the different cooling coefficients of Graphene and Cu. An automatic height alignment across the whole Copper-foil allows to measure Δ and Ψ micromaps of the creased foil. The automatic stitching of all measured field of views yield to a map of Δ and Ψ of the complete sample with a lateral resolution of 4 μm (Fig.1). In [2] a flakesearch algorithm is presented, that allows the localization of regions with defined layer numbers. The algorithm is extended to pinpoint monolayer regions on the complete map of Δ and Ψ and calculate the coverage. Measuring micromaps of Δ and Ψ offers a microscopic insight to the lateral distribution of Copper-oxide layer thickness even underneath a Graphene crystallite.

Summing up, we will present cutting-edge technology for the characterization of Graphene directly grown on Copper-foil including a detailed description of the substrate copper-oxide layer, altogether with the highest lateral resolution in the lower μm range.

Keywords: Graphene; Copper-foils; Imaging Ellipsometry

References

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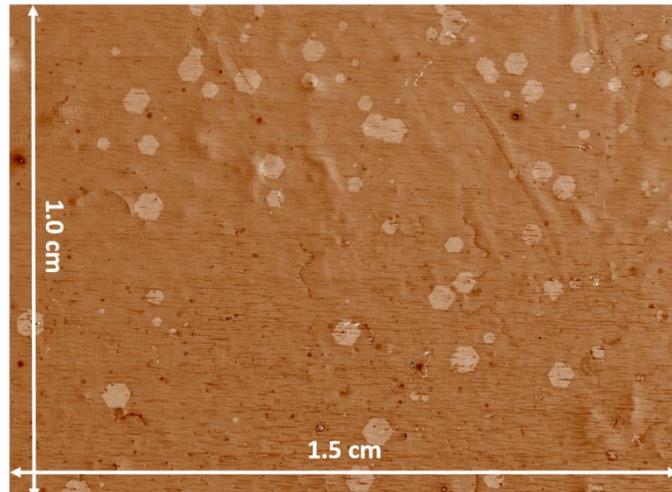


Fig. 1. Complete Δ map of Graphene on Copper