

Graphene grown on SiC substrates for applications in electronics

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Abstract

Since the isolation of graphene became accessible and the investigation of its properties revealed outstanding features [1-2], a large number of companies aiming the production of graphene-based materials and devices appeared in order to develop a new and powerful technology. However, the fabrication process of high quality graphene in an industrial scale remains as an open issue. The growth of graphene on Silicon Carbide (SiC) wafers is one of the most promising routes for both, production and integration into planar technology electronic applications [3-5]. We fabricated epitaxial graphene on top of different types of SiC substrates. Of particular interest for electronic applications are those in which a bottom gate is ready to be used and prepared prior to graphene growth. Processes of implantation of nitrogen atoms at a controlled depth have been used in order to fabricate such substrate. We investigated the properties of the graphene grown on top of them by means of non-invasive techniques, e.g. Raman spectroscopy and optical and atomic force microscopy (AFM), and completed the characterization with High Resolution Transmission Electron Microscopy (HRTEM) and transport measurements. As a result, we found that high quality single layer graphene is covering ~85% of the substrate and it appears to be a good candidate for the development of bottom gated devices based on graphene in an industrial scale.

References

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Figures

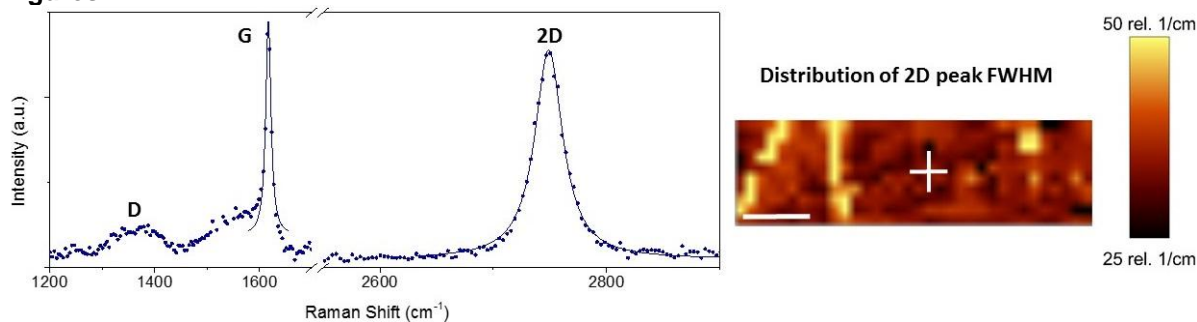


Figure 1: Raman results obtained on graphene grown on an implanted SiC substrate. On the left hand side, Raman spectra measured at the position indicated by the white cross in the picture besides. On the right hand side, mapping of the FWHM of the 2D peak, in which only the yellow dots indicate positions where single layer graphene is not found, as it can be inferred from the color scale to the right.

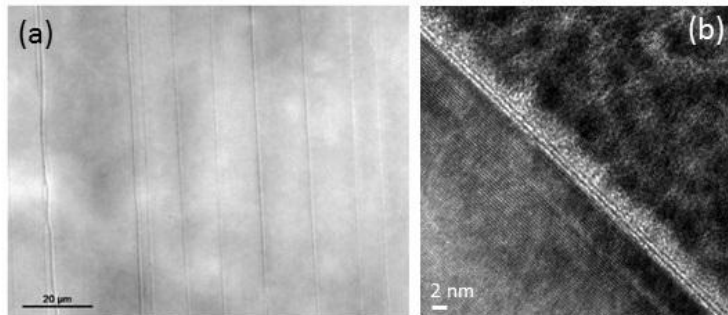


Figure 2.a.: Optical Image of a sample surface. Note the large width of the observed terraces. Figure 2.b.: HRTEM image of a sample, in which the presence of one graphene layer and the buffer layer are clearly seen (dark lines on the center of the image).