Influence of SiC substrate modification on the growth of epitaxial graphene

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Since the isolation of graphene in 2004 [1], the growth of research and applied technologies based on this material is exponential. To make these technologies accessible to an industrial level a systematic fabrication process, which makes production affordable, is highly demanded.
The epitaxial growth of graphene on Silicon Carbide (SiC) by thermal sublimation is one the leading techniques for such aim [2, 3, 4], however the improvement of the quality of the graphene layer remains as a challenge.
The use of CMOS compatible substrates improves the overall fabrication process of electronic devices, as graphene is from the beginning included in the supporting material. Moreover, the use of SiC allows us to effectively proceed with doping, implantation, or micro-structuring as required. Therefore, different steps of the production can be skipped, such as lithography and patterning, avoiding potential contamination and damages on the graphene layer.
We systematically grew epitaxial graphene on 6H-SiC on and off axis substrates, in which we slightly modified their intrinsic properties. Such modifications were controlled via nitrogen implantation and doping processes. We investigated the quality and properties of the prepared samples by means of Optical and Atonic Force Microscopy (AFM), as well as Raman Spectroscopy. Microstructural properties are correlated with Raman spectroscopy results.

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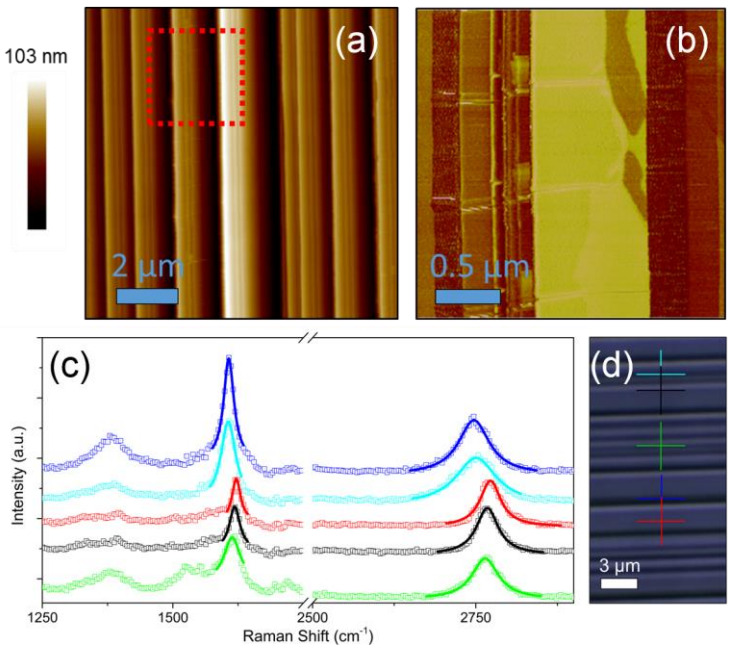

Fig. 1: (a) AFM topography image of the surface of one of the investigated samples. (b) AFM phase of the highlighted area in (a). (c) Raman spectrum obtained at different points of one sample, as indicated in the optical image shown in (d).