Substrate interaction in graphene on hexagonal boron nitride

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Interaction of the graphene layers with their substrate is a long-standing problem that needs to be considered when designing graphene-based devices. In most cases it leads to the shifting of Femi level due to transfer of the charge carriers between graphene and substrate (physisorption) or changes in the dispersion relation shape (chemisorption) [1]. Those effects often lead to changes in the electrical conductivity and charge carrier mobility of the graphene.
In order to mitigate this effect, for applications where conical band structure of graphene is desired, isolating substrate are often used. However, the substrate effect is still present. Eg. SiO_2 surface is rough, leading to curvatures and strains in the deposited graphene layers and electron puddling [2].
The hexagonal boron nitride seems to be one of the most promising materials that can be used as a substrate of graphene. It is characterized by ultra-flat surface, which should ensure high level of charge homogeneity as well as wide band gap, limiting its influence on graphene's electronic structure [3]. In our presentation we show the results of our experimental study on the characteristics of hexagonal boron nitride as well as the effect of its interaction with graphene. We present and discuss several issues that need to be taken into consideration when using h-BN as a substrate, such as electrostatic charges (Fig. 1) present on the hexagonal boron nitride layers.
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References

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Figures

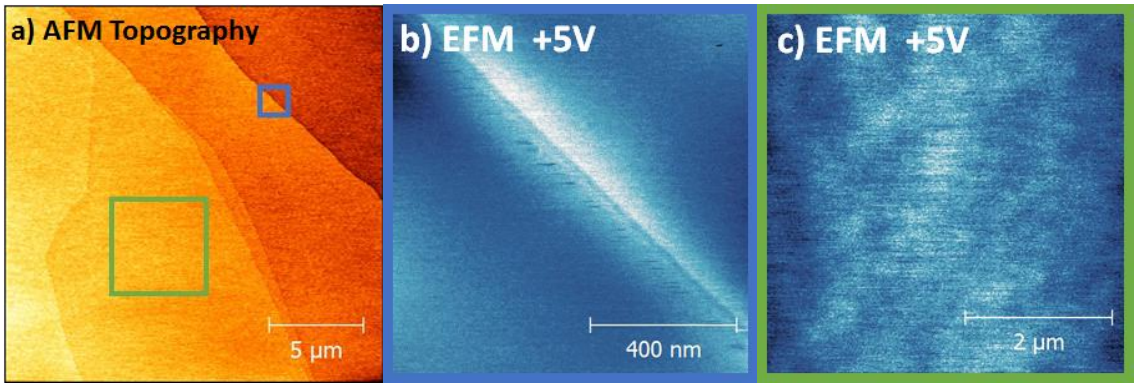

Fig. 1. a) AFM topography of hexagonal boron nitride, b,c) EFM images showing charge carrier pooling in different areas of the surface of hexagonal boron nitride.