Microscopic Correlation Between Chemical and Electronic States in Epitaxial Graphene Grown On SiC(000-1)

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The imaging of surfaces using X-ray PhotoElectron Emission Microscopy (XPEEM) has recently received considerable interest, mainly thanks to the use of high brilliance synchrotron radiation which facilitates the study of surface properties and chemical selectivity. The use of an energy filter permits to obtain chemical and work function mapping from real space imaging, which can be correlated, using reciprocal space imaging, to the complete band structure of a region of interest down to the micron scale.

We have studied spatial variations and correlations between the work function, chemical and electronic states of few layer graphene grown epitaxially on SiC(000-1), using full field, energy filtered XPEEM. Thanks to this technique, microscopic variations in the substrate/graphene interface are highlighted, depending on the graphene thickness (2-3 monolayers) and continuity. These variations would not be seen using area-averaged techniques, but are discernible on the length scale relevant for electronic devices. The full *k*-space band dispersion relations confirm the very high crystalline quality of the graphene layers and show a hitherto unobserved diffraction effect of the Dirac cones related to the registry between commensurately rotated graphene sheets. In the perspective of graphene for microelectronics, this underlines not only the importance of the sample preparation, but also the availability of spatially resolved spectroscopic tools to probe the local chemical and electronic structure.

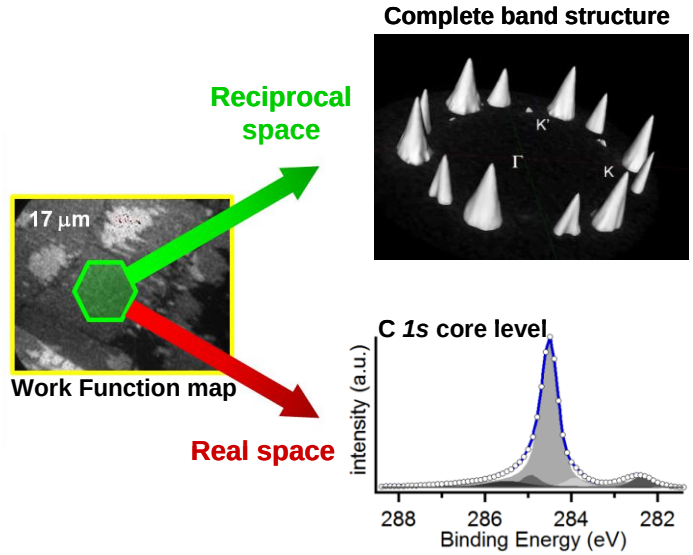

Figure 1: Work function map of a graphene sample epitaxially grown on a SiC(000-1) substrate. On a selected area, one can either image the real space, and obtain chemical information, or the reciprocal space and acquire the full band structure.

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