

Functionalization of Epitaxial Graphene by gold intercalation

M.N. Nair, T. Jiang, M. Cranney, F. Vonau, D. Aubel, M.L. Bocquet and L.Simon.

*Institut de Sciences des Matériaux de Mulhouse LRC 7228-CNRS, 4, rue des frères Lumière, 68093
Mulhouse, France*

ENS Lyon, Laboratoire de Chimie, UMR 5182 CNRS 46, Allée d'Italie

69364 Lyon CEDEX 07, France

contact@maya.narayanan-nair@uha.fr

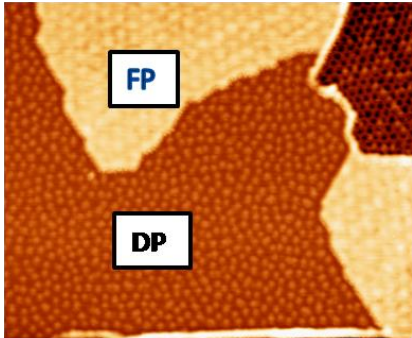
The epitaxial graphene formed on silicon carbide substrate is obtained by the annealing of the substrate at temperatures up to 1200°C. On the silicon terminated face of the hexagonal SiC(0001), it is formed a graphene layer partially covalently bonded to the substrate called buffer layer (BL) above which the actual graphene layer which shows the expected linear dispersion is formed. Epitaxial Graphene (EG) exhibits n type doping which is induced by the substrate. Inspired by the works of I. Gierz *et al* who proposed a simple way to shift Fermi level and induce p type doping by deposition of gold atoms on top of graphene [1], we have performed detailed Scanning Tunneling Microscopy studies of the deposition of gold atoms under ultra_high vacuum conditions and revealed that gold atoms can intercalate between the buffer layer and monolayer graphene in different forms depending on the specific preparation procedure. An inhomogeneous intercalation of gold atoms (DP) or continuous atomic thin film (FP) was first observed [2] then more exotic forms of intercalation such as stripes (SP) as shown in figure below, were also recently observed. Using Fourier transform scanning tunnelling spectroscopy [3], confirmed by Angle-resolved photoemission spectroscopy measurements [4], we have shown that the band structure of the upper monolayer graphene is modified by the inhomogeneous intercalation. Despite the intercalation process, the relativistic character of the quasiparticles is preserved and moreover showed a higher Fermi velocity than that for pristine graphene. The band structure is modified around the Van Hove singularity which shows a large extension [4]. With the help of periodic DFT calculations we discussed the position of the intercalated gold atoms between the ML and BL graphene (or under the BL) and showed the expected STM images and the DOS modifications.

References:

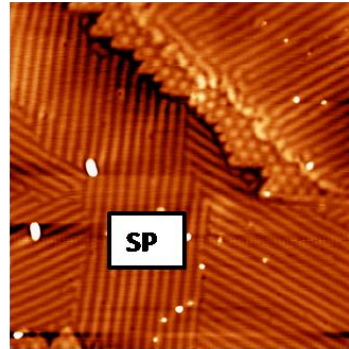
- [1] I. Gierz *et al*, Nano Letters, **8** (2008) 4603
- [2] B. Premalal *et al*, APL, **94** (2009) 263115
- [3] M. Cranney *et al*, EPL, **91** (2010) 66004
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Figures:

Figure shows the STM images of three different phases: FP (Film phase), DP(Diluted phase) and SP(Stripes phase)



(84 x 71 nm², -1.5 V)



(-1.5 V, 0.7 nA, 70 nm)