Epitaxial graphene/metal hybrids

Johann Coraux

A number of transition metals may serve a supports and catalysts for the growth of epitaxial graphene. In the last few years synthesis routes which were historically parallel are converging: on one hand, preparation under ultra-clean conditions, namely under ultra-high vacuum and at the surface of single crystal metals; on the other hand, growth under pressures approaching atmospheric conditions, at the surface of metallic thin films. In both cases graphene layers having high quality can be obtained. The first approach delivers model systems especially suited to fine surface science studies. The second approach is motivated by the prospect for mass production of graphene.

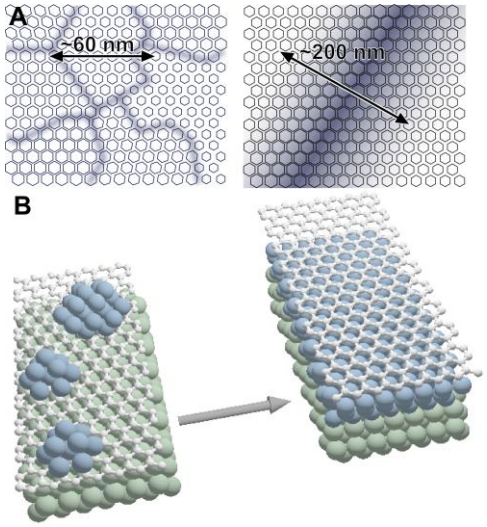

Figure: A. *Domains with varying local structure (left) and a domain wall with strain between two domains (right) (the hexagon's shape represent the shape of the graphene unit cell).* ***B.*** *Co clusters on graphene/Ir(111), which are intercalated between graphene and Ir upon annealing.*

I will present our recent studies on a particular graphene/metal system which is a case study for graphene weakly interacting on its substrate, graphene/Ir(111), which we have been revisiting since 2007 and allows for the preparation of ultra-high quality graphene [1-5]. I will show that even in such a high quality system, small small imperfections, causing distributions of the lattice parameter in graphene of a few hundredths of an ångström, are present [6]. I will then present our recent studies devoted to the deposit of metals on graphene/Ir(111), which leads to ordered two-dimensional arrays of magnetic nanoclusters [7] or ultra-thin magnetic films intercalated between graphene and its metallic substrate [8].

References

[1] J. Coraux *et al.* Nano Lett. **8**, 565 (2008).
[2] J. Coraux *et al.*, New J. Phys., **11**, 023006 (2009).
[3] R. van Gastel *et al.*, Appl. Phys. Lett. 95, 121901 (2009).
[4] H. Hattab *et al.*, Appl. Phys. Lett. **98**, 141903 (2011).
[5] C. Vo-Van, *et al.*, Appl. Phys. Lett. **98**, 181903 (2011).
[6] N. Blanc, *et al.*, submitted.
[7] A. T. N'Diaye *et* al., New J. Phys. **11**, 103045 (2009). C. Vo-Van *et al.*, Appl. Phys. Lett. 99, 142504 (2011).
[8] J. Coraux, *et al.*, submitted.