Effects of metal deposition on epitaxial graphene

Quentin Berrahal
Yann Girard, Jerome Lagoute
Univ Paris Diderot, Sorbonne Paris Cite, CNRS
MPQ Lab, UMR 7162, 75013, Paris, France
quentin.berrahal@univ-paris-diderot.fr

Our use of the C-rich (000-1) surface of silicon carbide (SiC) as a substrate permits the ultra-high vacuum in situ synthesis of epitaxial graphene with a typical non-Bernal stacking (unlike graphite) and a control of the average number of graphene layers (from a few to dozens). Au intercalation has been previously proved on the Si-rich (0001) surface[1] but only with a single strongly doped graphene layer. A more graphene-like decoupled behaviour is therefore expected on the (000-1) than on the (0001) side. The physical deposition of several metals (Au, Pt, Co…) before or after the graphene synthesis followed by different annealing procedures brings a great variety of features (e.g intercalation). We studied them using low temperature Scanning Tunnelling Microscopy and Spectroscopy (STM and STS) which provide atomic spatial resolution and a measure of the Local Density of States (LDOS) of these features. Post-synthesis deposition of gold brought different kind of Au islands with different kind of spectroscopic features (see **fig. 1**) : few-atoms clusters with very sharp resonances, few-nanometers islands with more complex LDOS characteristics (both of which appear to be on top of the graphene) and intercalated clusters laying underneath the graphene with a modified graphene LDOS. Pre-synthesis gold deposition lead to the formation of structural gold-induced defects, in particular "flower-shaped" ones[2] (see **fig. 2**). They seem to originate from the high mobility of gold during the synthesis. Each of them had distinct spectroscopic features, some possibly arising from confinement.

References

[1] B. Premlal et al., Appl. Phys. Lett, 263115 (2009) 94
[2] E. Cockayne et al., Journal, 195425 (2011) 83

Figures

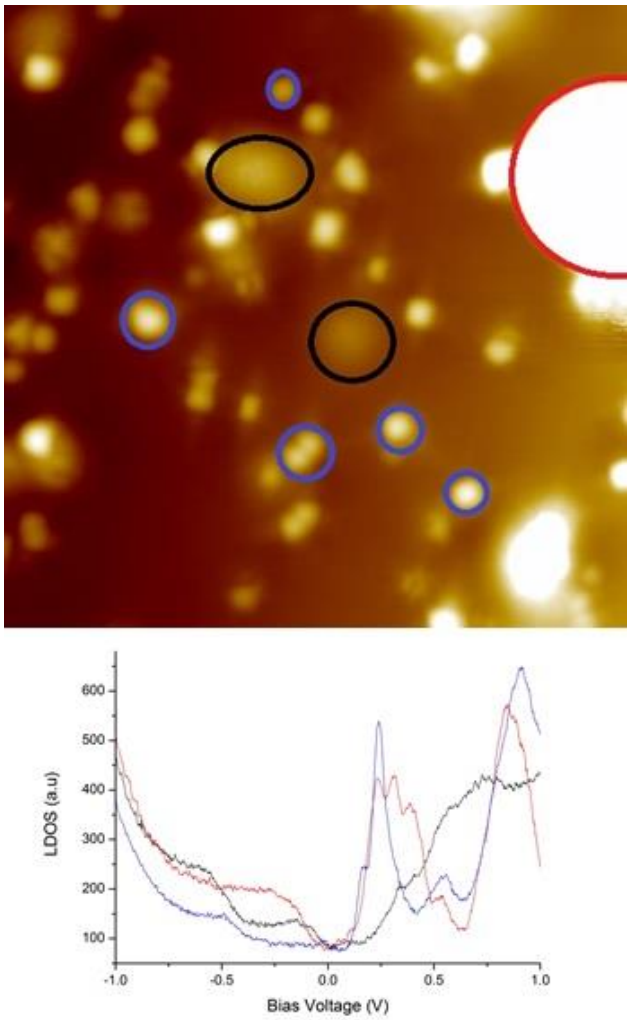

Figure 1: Gold features: intercalated (black), small clusters (blue), big islands and their spectra (STM image)

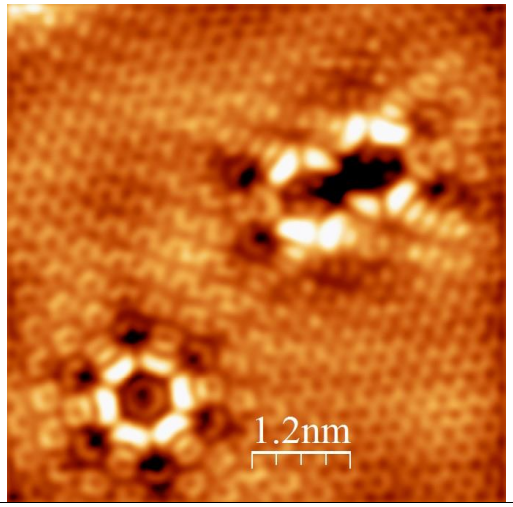

Figure 2: Two "flower" defects on graphene: one simple and one double with electronic interferences in between (STM image).