Arrays of preformed Pt clusters on graphene in epitaxy on Ir(111).

Sébastien Linas[1], Fabien Jean[2], Clément Albin[1], Florent Tournus[1], Laurent Bardotti[1] and Gilles Renaud[3].

[1] Institut Lumière Matière, Université de Lyon, UMR5306 Université Lyon 1-CNRS, 69622 Villeurbanne
[2] Institut NEEL, CNRS and Université Joseph Fourier, 38042 Grenoble
[3] CEA-UJF, INAC, SP2M, 17 rue des Martyrs, 38054 Grenoble
Sebastien.linas@univ-lyon1.fr

Physical and chemical properties of clusters are influenced by their size. Examples of unique cluster properties are plasmon resonance, [1] superparamagnetism, [2] or size dependant catalytic activity. [3] In addition to their size, the local environment of the nano-particles (NPs) can modify their behavior. A regular array of clusters provides a similar environment to each NP, facilitating the study of its properties. In this domain, the moirés resulting from graphene in epitaxy on metal (GEM) have been previously used as nano-templates for lattices of metallic clusters grown by vapor phase deposition. [4]
This work presents the organization of preformed Pt clusters on the moiré lattice of GEM. The Pt NPs, produced by a laser vaporization source, size selected by a quadrupolar deviator are then deposited in ultra high vacuum at room temperature (RT). [5] This technique allows to tune the NPs density independently of their size.
Surface X-rays diffraction and grazing incidence small angle X-ray scattering experiments (GISAXS), figure 1a as well as scanning tunneling microscopy imaging (STM), figure 1b have revealed the organization of the NPs on the moiré lattice. The evolution of this ordering with annealing as well as the epitaxy of Pt clusters with the Ir(111) surface will be also discussed.

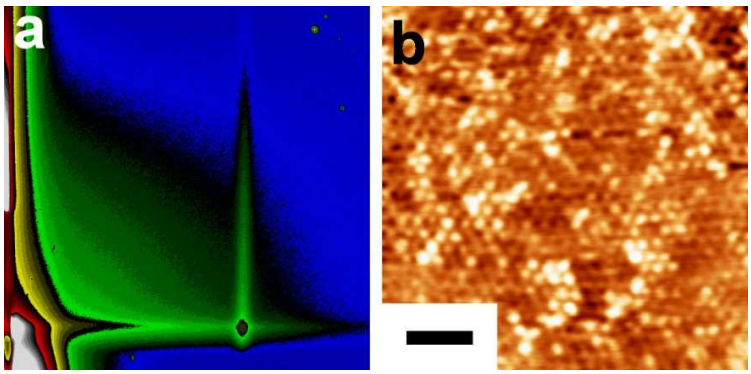

Figure 1: (a) 2D GISAXS Intensity at RT of Pt clusters deposited on Ir(111) supported graphene, showing that the NPs are organized on the graphene/iridium moiré network. (b) STM image of the same system. The scale bar is 10 nm.

References

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