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Substrate/nanodot Exchange Coupling For Co Nanodot Arrays Grown On Rare Earth–Au (111) Based Nanotemplates

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Controlling and manipulating exchange coupling and anisotropy in patterned magnetic nanostructures is the key for developing advanced magnetic storage and spintronic devices. Scanning tunneling microscopy analysis of different rare earth (RE)-Au (111) surfaces reveals the formation of a trigon network that transforms with longer evaporation times into a RE-Au_2 surface alloy with 1-2 ML of thickness. Both structures are found to provide optimal nucleation points for the formation of hexagonal arrays of Co nanodots. In the case of Gd as RE, X-ray magnetic circular dichroism measurements reveal an antiferromagnetic coupling across the Co/nanotemplate interface. In the particular case of the $GdAu_2$ surface it is found that the coupling is very strong, which is corroborated by full-potential linearized augmented plane wave calculations. These studies find that the anisotropy of the Co nanodots is profoundly modified by the influence of the $GdAu_2$ nanotemplate that induces large anisotropy values. In clear contrast with non-magnetic Au substrates, $GdAu_2$ triggers the early switch in the anisotropy direction from out-of-plane in monolayer-thick Co, to in-plane, in bilayer Co films.

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Ultra High Vacuum PVD Graphene growth on Cu-foils from a C_{60} carbon source: growth and characterization

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The production of high-quality inexpensive graphene is an absolutely necessary first step for the material to ever live up to its promise in commercial applications. Among the different growth methods reported to date, physical vapor deposition (PVD) from a suitable organic precursor emerges as an advantageous procedure since lower substrate temperatures are required to produce graphene [1-2]. On the other hand, particularly attractive is the use of low carbon solubility Cu substrates for graphene growth, owing to its inexpensiveness and the possibility of post-growth graphene transfer on arbitrary substrates [3].

In this work, we present the growth of graphene layers by PVD under ultra-high vacuum conditions on polycrystalline 25 µm oxygen-free Cu foils. We used as carbon source a C_{60} evaporator maintained at 500 ºC. Prior to carbon evaporation the Cu foils have been treated by Ar-sputtering and thermal annealing cycles in order to clean them and promote the growth of well oriented large Cu terraces, especially suitable for LEED analysis (figure 1). After graphene growth is complete, sample analysis is performed with different techniques to characterize the structure and quality of the graphene layer. In-situ LEED images show well defined Cu (111) and (100) reflections and rings corresponding to graphene in various orientations with respect to the Cu grains (figure 1). Ex- situ Atomic Force Microscopy (AFM) and Raman spectroscopy are employed to gather information on sample morphology and quality (figure 1). We are currently optimizing graphene transfer from our samples to insulating oxide substrates with aim to determine its bandgap and macroscopic and local magnetotransport properties.

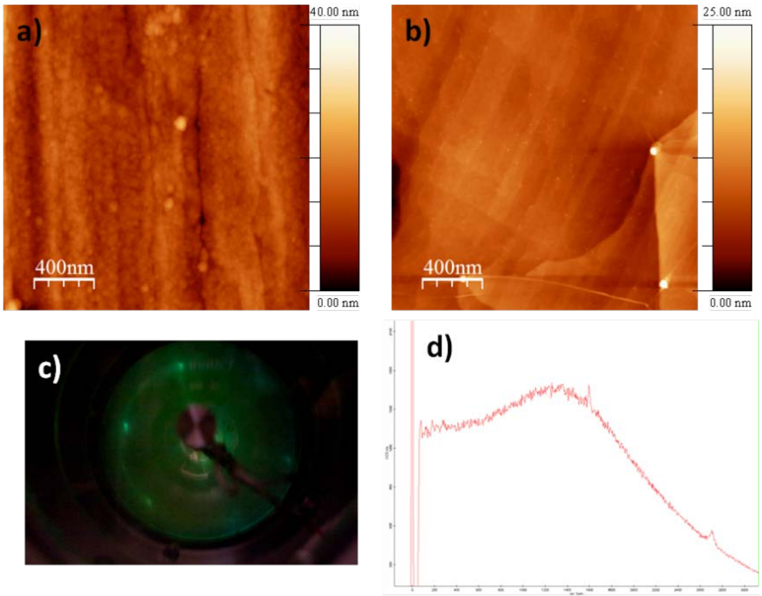

Figure 1: (a) AFM topographic image of a Cu foil substrate before and (b) after cleaning treatments and graphene deposition. (c) LEED image of as-grown graphene on Cu-foil showing a (111) domain grain measured with 100 eV. (d) Raman spectra of graphene covered Cu foil**.**

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Unusual Surface Faceting Induce by Metal Organic Complexes

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