ASSEMBLING MONOLAYERS OF MAGNETIC NANOPARTICLE ONTO TECHNOLOGICAL SUBSTRATES

Luís Peña, Miriam Varón, [†] Lluis Balcells,* Víctor Puntes, [†] and Benjamín Martínez**
*Institut de Ciència de Materials de Barcelona, Bellaterra, Spain
[†] CIN2, Universitat Autònoma de Barcelona, Bellaterra, Spain
lpena@icamab.es

Obtaining monolayers of highly ordered magnetic nanoparticle onto technological substrates is a very interesting issue from both basic research and technological points of view. Long range ordered arrays of magnetic nanoparticles have a great potential for applications in magnetic and electronic devices, thus making this field of research a very active one in the past few years. An ordered array of such nanoparticles can be used in novel tunnel magnetoresistence device or spin-torque nano-oscillators. Nevertheless, obtaining highly ordered monolayers of magnetic nanoparticles on top of on technological substrates has revealed to be a hard attainable issue. The common method to produce ordered two-dimensional arrays of nanoparticles is self-assembling. Self-assembling is a complex process in which several interactions between nanoparticles, substrate, and solvent are involved. As a result of the complexity of the process, a mixture of mono- and bi-layers with order in the few nanometres range is usually obtained when dealing with substrates with technological interest, such as complex oxides. Here we propose an alternative method to obtain highly ordered magnetic nanoparticle monolayers on these technological substrates. The method consists of depositing on the substrate an amorphous carbon membrane that previously has been covered with nanoparticles by spin coating. This new method is reproducible, robust and scalable, and is insensitive to the substrate material and topography. Here we present some preliminary results depositing highly ordered monolayers of cobalt superparamagnetic nanoparticles on top of silicon substrates.
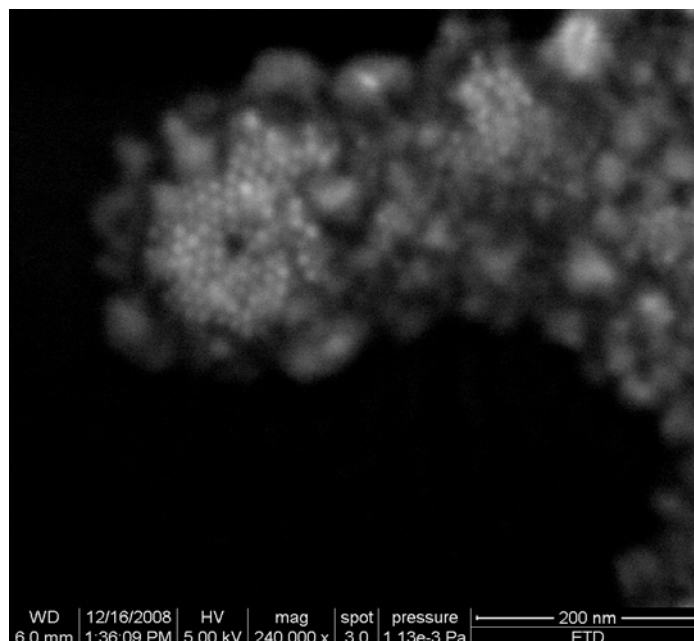
Figures:

Fig. 1._ Secondary electrons SEM image of highly ordered self-assembled monolayer of Cobalt nanoparticles (white circles) on Silicon substrate. The average nanoparticles diameter is 6 nm.