SELF-ASSEMBLING OF MAGNETIC NANOPARTICLE ONTO TECHNOLOGICAL SUBSTRATES

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Obtaining monolayers of highly ordered magnetic nanoparticles (NPs) onto technological substrates is a very interesting issue from both basic research and technological points of view. Long range ordered arrays of magnetic NPs 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 Nps can be used in novel tunnel magnetoresistence device or spin-torque nano-oscillators. Nevertheless, obtaining highly ordered monolayers of magnetic NPs on top of on technological substrates has revealed to be a hard attainable issue. The common method to produce ordered two-dimensional arrays of NPs is self-assembling. Self-assembling is a complex process in which several interactions between NPs, 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. In this work we report on self-assembly processes of Co NPs (10 nm in diameter) on top of silicon substrates by using different techniques. Samples have been prepared by using drop-casting, spin coating and Langmuir-Blodgett techniques. The influence of different parameters such as substrate temperature, evaporation time, NPs concentration, etc., are analyzed. By using the two first techniques self-assembled monolayers of Co nanoparticles in the micrometric range have been obtained (see Fig. 1). The Langmuir-Blodgett technique has also been used to study self-assembly processes of silica NPs of about 70 nm in diameter on Silicon and glass substrates. Preliminary results on this latter issue will also be discused

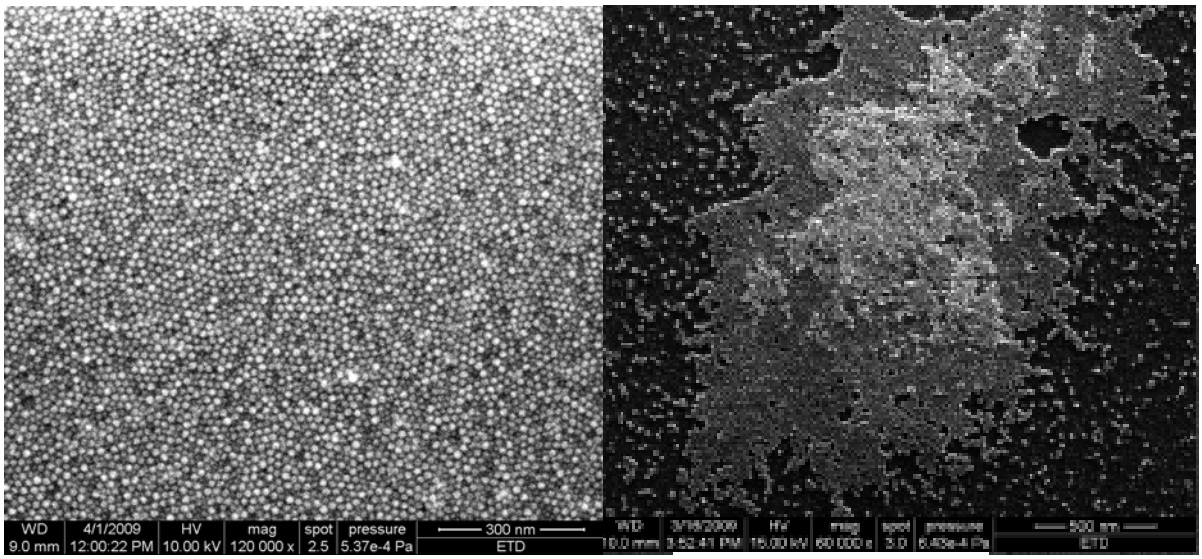

Figure 1: SEM micrograph of a self-assembled monolayer of Co nanoparticles (left). Detail of an area with transition from a single to double layer assembly.