

DIPOLAR DRIVEN SPONTANEOUS SELF ASSEMBLY OF SUPERPARAMAGNETIC Co NANOPARTICLES INTO MICROMETRIC RICE-GRAIN LIKE STRUCTURES

Miriam Varon^a, Luís Peña^b, Lluís Balcells^b, Vassil Skumrye^c, Benjamín Martínez^b, and Victor Puntès^a

a) Institut Català de Nanotecnologia, Campus UAB, 08193 Bellaterra, Spain.

b) Institut de Ciència de Materials de Barcelona (ICMAB-CSIC), 08193 Bellaterra, Spain.

c) Intitució Catalana de Recerca I Estudis Avançats, ICREA. Barcelona-08010 and Department of Physics. UAB, Bellaterra-08193, Spain.

balcells@icmab.es

Abstract. Superparamagnetic single crystal single domain Cobalt nanoparticles of 6 nm in diameter evaporated onto Highly Pyrolytic Oriented Graphite spontaneously self assemble into super structures with an elongated shape. These structures have been studied by optical and scanning electron microscopies, atomic and magnetic force microscopy, electron dispersive x-ray analysis and SQUID Magnetometry. We propose that the weak dipolar interactions between superparamagnetic dipoles of the cobalt nanoparticles are the responsible for the formation of this structures when the dipolar magnetic interactions are strong enough to influence the general process of self assembly dominated by Van der Waals forces between nanoparticles and between nanoparticles and substrate, and the evaporation dynamics of the experiment.

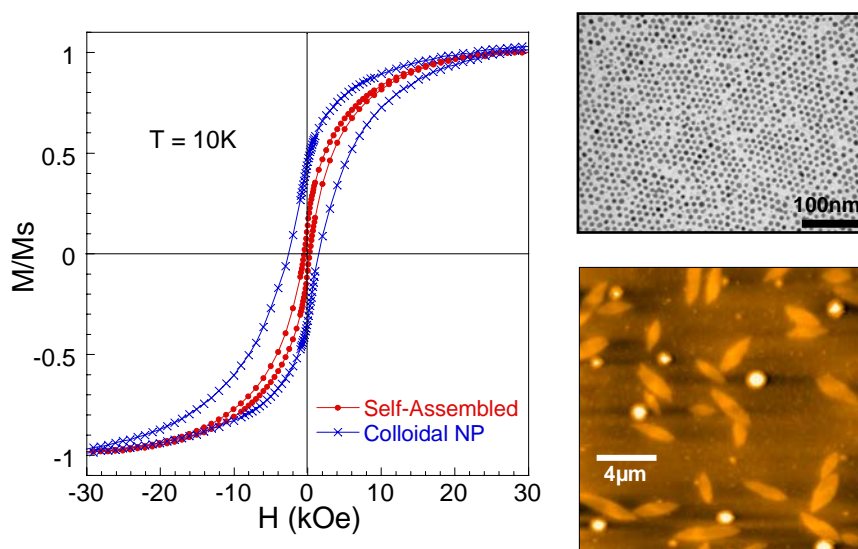


Figure. Left: Hysteresis loop for colloidal and self-assembled Co NP at low temperature. Right up: TEM images of Co nanoparticles. Right down: AFM image of self-assemble structures integrated by cobalt NP.