

NANOMAG PLATFORM: SYNTHESIS AND CHARACTERIZATION OF MAGNETIC NANOPARTICLES BIO-FUNCTIONALISED AND STABLE IN BIOLOGICAL MEDIA

Francisco del Pozo Guerrero, José Javier Serrano Olmedo, Jesús Santamaría Ramiro, Carles Arús Caraltó, Simó Schwartz Navarro, Bernardo Celda Muñoz, Nuria Vilaboa Díaz, María Pilar Marcos, Laura M. Lechuga Gómez, Maria Vallet Regí, J.P. García Ruiz and Concepción Solans
fpozo@gbt.tfo.upm.es

It has been shown that the magnetic condition of nanoparticles offers interesting possibilities in diagnosis, therapy and biomedical research.

To get the appropriate benefit of that magnetic condition in biomedicine requires, however, the intense physical and functional characterisation of these magnetic nanoparticles. Here we present the NANOMAG platform, which is being arranged to provide the technology to achieve that objective for a wide range of applications, namely: 1) the development of biological markers for MR-based diagnostic modalities; 2) the guidance of magnetic nanoparticles by external magnetic fields; 3) the remote control of hyperthermia and drug delivery therapies.

The use of magnetic nanoparticles face several associated problems, which defines the specific aims of NANOMAG experimental settings:

- 1) the particle aggregation causes instability and is responsible for changing particles mobility in the biological media, makes fictionalisation difficult and alters cellular internalisation, produces its accumulation in some organs and make difficult to reproduce experiments
- 2) transportation and focalization of the nanoparticles requires not only the external instrumentation to generate large magnetic gradients, but nanostructures designed with large magnetic momentum and physical properties to maintain these properties under aggregation.
- 3) an intense relaxation signal has to be procured to allow RM detectability with small particle concentrations
- 4) hyperthermia suitability requires “smart” nanoparticles designed to optimise its capacity to deliver heat
- 5) the magnetic control of drug delivering has to be achieved in terms of target concentration and drug delivery dynamics

NANOMAG Project has tow main outcomes: 1) to arrange the infrastructure and procedures for the physical and functional magnetic nanoparticles characterization to cope with the objectives above; 2) to fabricate a variety of nanoparticles of different composition, size and form, intensively characterized and stable in the biological media to offer to any interested party of the scientific community.

The partners of this project are involved in particle fabrication, covering a wide range of fabrication techniques; partners in the field of physics (magnetism) and electronics in charge of the definition and implementation of the nanoparticles evaluation infrastructure and procedures; and partners that bring well specified uses of the nanoparticles that will bring into the project the real needs to be fulfilled.