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Q: What led you into science and your chosen area of research?

I was very lucky to do my PhD at the institute of Materials Science in Madrid, an institute of excellence. I learnt to work with a will and professionally, and both have driven my career. Also, my family have been always beside me. I decided to work on nanotechnology applied in biomedicine because I would like to see my knowledge translated into meaningful benefits for people.



Q: Can you explain the importance and impact of your paper, *Progress in the preparation of magnetic nanoparticles for applications in biomedicine*, for your field?

This review summarizes recent advances in synthesis routes for quickly and reliably making and functionalizing magnetic nanoparticles for applications in biomedicine. We put special emphasis on describing synthetic strategies that lead to the production of nanosized materials with well-defined physical and crystallochemical characteristics as well as colloidal and magnetic properties. Rather than grouping the information according to the synthesis route, we have described methods to prepare water-dispersible equiaxial magnetic nanoparticles with sizes below about 10 nm, sizes between 10 and 30 nm and sizes around the monodomain–multidomain magnetic transition. We have also described some recent examples reporting the preparation of anisometric nanoparticles as well as methods to prepare magnetic nanosized materials other than iron oxide ferrites. Finally, we have described examples of the preparation of multicomponent systems with different natures (purely inorganic or organic-inorganic nature)

Q: What research projects are you working on at the moment?

My research focuses on developing therapeutic magnetic nanocarriers for early diagnosis of different diseases by NMR imaging and its treatment by linking therapeutic drugs to the nanoparticles. We are trying to determine the distribution of nanoparticles in the body following systemic administration as a function of its size, shape, physical properties and surface chemistry. Modern approaches like thermal decomposition in organic media or laser and spray pyrolysis of metal organic compounds are used in our lab for the synthesis of new nanomaterials. Further modification of nanoparticles is a pre-requisite for almost any application. Chemisorbed organic monolayers and/or additional inorganic shells on core nanocrystals are tested. The goal of the modification is to introduce certain properties to the core-nanoparticles, such as colloidal stability in water, thermal stability, functional groups or morphological properties. Biomedical tests are done in collaboration with different labs.

Q: What do you think will be the next big breakthrough in your field?

The big breakthrough for nanomedicine will be to translate novel laboratory innovation into commercially viable medical products—better laboratory diagnostic tools for screening different diseases in a non-invasive and accurate way, and for administering safe and effective therapeutic agents, which would be lesion specific and with few side effects.

An important step will be to advance our scientific knowledge and understanding of safety and efficacy of nanotechnology when applied to medical devices and therapies.

Q: What single piece of advice would you give a young researcher embarking on a career in physics?

A young researcher embarking on science should be enthusiastic and precise with the work and resolve to be patient. The answers are there but it is difficult to find them. In my opinion this the best job in the world.

Q: What has been the most exciting moment in your career so far?

The most exciting moment in my career was the day I defended my Ph. D thesis. I was very nervous but I successfully defended my PhD and I felt I was the person who knew the most about the subject.

Q: What is your favourite (non-physics) book/ author?

I like to read and it is difficult to choose only one book or author. One of my favourites is the Nobel Laureate in Literature José Saramago and his excellent book *Blindness*. A Spanish author that I like is Almudena Grandes and I just finished her book *The Frozen Heart*, which is really good.

Progress in the preparation of magnetic nanoparticles for applications in biomedicine is from a Cluster Issue on 'Progress in Applications of Magnetic Nanoparticles in Biomedicine' in Volume 42 Issue 22 of Journal of Physics D: Applied Physics.

This paper along with two others in the review will be free-to-read until 6th November 2010.