

Multifunctional nanoplatform for biomedical applications

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Nanotechnology enables addressing challenges otherwise difficult to reach, like the simultaneous diagnostic and therapies using the same material. Here we present a multifunctional synthetic platform consisting on a hydrophobic polymer that may be used as a matrix for the encapsulation of inorganic nanoparticles (magnetic, luminescent, and radioactive). The matrix contains a Michael-donor (or an acceptor) on its surface for functionalization. Organic bioactive molecules are attached to one end of a hydrophilic polymer (i.e. PEG) terminated on a Michael acceptor (or a donor), and then they are anchored to the hydrophobic core by Michael addition. This system has the advantages of a clean synthesis (no by-products), mild conditions, and an easy and controlled multifunctionalization. So far, we have incorporated to this platform: magnetic nanoparticles, radioactive substituents, optical dyes (fluorescein and rhodamine), a therapeutic drug, an antibody, and an optical thermometer made of lanthanide complexes. Health safety of the system has been tested in cellular and *in vivo* assays. The nanoplatform is highly stable in biological fluids, shows low cell toxicity, high capacity of cell internalization, excellent hematocompatibility, and anticoagulation properties. It is shown that magnetic properties can be tuned up in the whole superparamagnetic range. Moreover, the system has shown excellent performance in magnetic resonance imaging and hyperthermia.

Biography

Fernando Palacio is Professor of Research of the Consejo Superior de Investigaciones Científicas (CSIC) at the Materials Research Institute in Zaragoza and member of the Department of Condensed Matter Physics of the University of Zaragoza. He is also the Vice-Chairman of the European Institute of Molecular Magnetism. He did his graduation in Chemistry and gained his Ph.D. degree from the University of Zaragoza. Postdoctoral stays at the University of Oxford and the University of Illinois in Chicago. Part of his research activity deals with the study of magnetic nanoparticles prepared as multifunctional synthetic platforms and the development of their ferrofluids. He is currently interested in understanding their magnetism and in their biomedical applications.

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