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# Multifunctional nanoplatform for biomedical applications

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## Abstract

Nanotechnology enables addressing challengesotherwise difficult to reach,like the simultaneous diagnostic and therapies using the same material. Here we present a multifunctional synthetic platform consisting on an hydrophobic polymer that may be used as a matrix for the encapsulation of inorganic nanoparticles (magnetic, luminescent, radioactive, …). The matrix containsa 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 areanchored 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 therapeutical 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 InvestigacionesCientificas (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.Graduation in Chemistry and PhD 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.