

Multifunctional coating platform for the biomedical applications of magnetic nanoparticles.

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Nanotechnology offers clear advantages over conventional techniques that can suppose a real breakthrough in biomedical research, and health care. It enables the development of multifunctional systems incorporating physical and biological functionalities in a single particle that could perform simultaneously several operations such as driving, sensing, imaging and therapy. The paper will provide an overall vision of these possibilities and will present a core-shell multifunctional polymeric platform containing magnetic nanoparticles, luminescent centres and anchoring sites for biologically active molecules. The coated nanoparticles are stable in biological fluids, show low toxicity, excellent hemocompatibility, ability for cell internalization, anticoagulation properties, and very good performance in magnetic resonance imaging and hyperthermia. The magnetic properties of the nanoplatform (magnetic moment, susceptibility, blocking temperature, relaxivity, etc) can be tuned in the whole superparamagnetic range and further by changing the size of the magnetic nanoparticles from 2 to 25 nm. The total particle hydrodynamic diameter can be varied from 30 to 150 nm. The synthesis is based in a polymeric route, and all the components are biocompatible.