HIBRYD MAGNETIC NANO-ARCHITECTURE FOR APPLICATION IN BIOMEDICINE AND ENERGY

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Magnetic Nanoparticles (MNPs) are unique complex objects whose physical properties differ greatly from their parent massive materials. In fact, the magnetic properties are particularly sensitive to the particle size, being determined by finite size effects on the core properties, related to the reduced number of spins cooperatively linked within the particle, and by surface effects, becoming more important as the particle size decreases. [1–3] MNPs play an important role in nature, as they are commonly found in soils, sediments and rocks and may store information on the past Earth's magnetic field as well as environmental conditions at the time of sediment deposition. In addition, magnetic nanoparticles have generated much interest because of their possible applications in high density data storage, ferrofluid technology, catalysis and biomedicine (drug delivery, contrast enhanced MRI). Design of magnetic nano-architecture (MNA) for specific applications means to control the matter at the nanoscale, correlating magnetic properties, micro- and meso-structure and molecular coating. These MNA are typically of core-shell morphology, with a magnetic core and a shell that may be composed of polymers surfactants or mesoporous silica, which typically serve for embedding the therapeutic agents within their framework. Selectivity of the treatment is ensured through employing magnetic field responsive homing of the nanocarriers to the therapeutic area, along with possibilities for alternating magnetic field hyperthermia-resulted treatment of the ill tissues. The induced hyperthermia may be therapeutically active through causing denaturation of biomolecules in the treatment area, or/and through mediating release of the cargo therapeutic agents. Taking into account all of these points, this communication will focus on the design MNA for application in biomedicine discussing some recent results synthesis and functionalization of magnetic nanomaterials[4–6]. Finally, preliminary results and some perspectives for application of magnetic nanoparticles in thermoelectricity, permanent magnets, catalysis and other technological field will be discussed.

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