Multifunctional magnetic-based theranostic nanoparticles

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Magnetic nanoparticle (MNP)-based theranostics are emerging as important tools for diagnosis and treatment (theranostics) of various cancer types, and bone disorders. Synthesis of MNPs who can act as Magnetic Resonance Imaging contrast agents with high relaxivity and low toxicity is one of the major pre-requisite in the field of theranostics [1]. Also, such applications require magnetic nanoparticles with well-defined composition, narrow size distribution, and high saturation magnetization values for enhanced interaction with an externally applied magnetic field. Spinel ferrites with the general formula MFe_2O_4 (M = Mn, Fe, Co, Ni) have been proposed to act of MRI contrast enhancement agents among other types of MNPs based on both transition metal ions and rare earth elements in the presence of various organic moieties, polymers, ligands, etc (Figure 1).

A facile solvothermal approach was used to synthesize stable ferrite nanoparticles as a simple and eco-friendly route, providing though products that exhibit high crystallinity in the presence of well-defined polymers and/or organic ligands. The hydrophobic MNPs converted to hydrophilic and the hyperthermic effects as well as relaxometric properties were studied and evaluated [2,3].

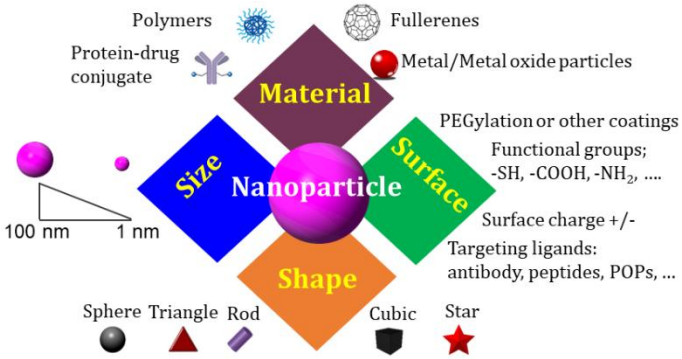

Figure 1

References:

[1] Magnetic Nanomaterials as Contrast Agents for MRI. Caspani et al., Materials 13, 2586 (2020).

[2] Magnetic colloidal superparticles of Co, Mn and Ni ferrite featured with comb and linear type amphiphilic polyelectrolytes; NMR and MRI relaxometry. M. Menelaou et al., Dalton Transactions 44, 10980 (2015).

[3] Evaluation of nickel ferrite nanoparticles coated with oleylamine by NMR relaxation measurements and magnetic hyperthermia. M. Menelaou et al., Dalton Transactions, 43, 3626 (2014).