Synthesis and Characterization of Multifunctional Nanoparticles for Biomedical Applications

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Iron oxide nanoparticle (NP) has been considered an ideal material for biological magnetic applications such as magnetic resonance imaging, targeted drug delivery for antitumor therapy, hyperthermia treatment of cancers. In our study, seed-mediated process was applied to control particle size. Starting from the seed particles of 10 nm, iron oxide NPs of 16 nm and 20 nm were synthesized successively with superparamagnetic behavior and the magnetization saturation up to 77 emu g-1. Monodisperse Fe3O4 hollow spheres were also fabricated through a process with FeCl3•6H2O and ammonium acetate as the reactants in an ethylene glycol solution. The hollow interior structure was formed based on the aggregation of small particles followed by the gas-bubble-assisted Ostwald ripening process. Those nanostructures were ferromagnetic materials with the saturation magnetization of 81.0 emu g-1. We studied systematically the formation of those nanoparticles by SEM, TEM observations and also by XRD and FT-IR measurements.