FERROMAGNETIC MANGANESE PEROVSKITE NANOARTICLES

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Abstract

The manganese perovskites of the general formula La1-xSrxMnO3 were selected as possible materials for medical applications, diagnostic, magnetic resonance imaging and therapy, magnetic fluid hyperthermia. Solution of this task is considerably complex and depends on a number of problems which should be solved step by step.

The synthesis of the magnetic cores was effectuated by the sol-gel method followed by thermal and mechanical treatment. Obviously the resulting magnetic properties of the cores are markedly sensible on the conditions of the synthesis. The cores should be further covered by a protective layer, preferentially of a hydrated silica oxide. Silica shell generates due to electrostatic repulsions of the $(Si-O)^-$ groups suspensions of a high stability in the water medium of pH approximately 7 and simultaneously form a biologically inert barrier, protecting the surrounding environment from the chemical effects of the core.

Therefore the study requires a qualified feedback based on a number of the characterization methods, like X-ray analysis, TEM, magnetic studies, i.e. measurements of magnetizations in DC and AC fields, investigation of the ferromagnetic–superparamagnetic–paramagnetic transition, measurements of the relaxivities, magnetic heating experiments and biological tests of the viability. This long and uneasy way was now successfully accomplished as it is evidenced by in vitro and in vivo experiments. Nevertheless in spite of the promising results the real clinical applications require a cautious approach and an effort in a near future.

Keywords: magnetic nanoparticles, therapy, diagnostic

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