Physico-Chemical Nanomaterials Science

Peculiarities of Synthesis of $La_{1-x}Sr_xMnO_3$ Nanoparticles Obtained by Precipitation from Dyethyleneglycol Solution

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Nanoparticles of ferromagnetic materials have found numerous practical applications in different fields of science and engineering, particularly as magnetic sensors, multyferroics, metamaterials and in medicine for targeted drug delivery, therapy and diagnostic and hyperthermia. They must satisfy a number of requirements for their successful application in medicine, especially in hyperthermia. Namely, particles must be weakly agglomerated, single-domain, superparamagnetic, they must have high values of specific loss power (SLP) under action of an alternating magnetic field and also they should heat up to certain temperatures (42-45°C). Hetero-substitute lanthanum manganites $La_{1-x}Sr_xMnO_3$ are of particular interest, because we can control their Curie temperatures in the range of 20-70°C changing chemical composition, and maintaining necessary temperatures (42-45°C) automatically. Such particles can be obtained by precipitation from dyethyleneglycol solution as organic environment allows obtaining weakly agglomerated nanoparticles.

This work is devoted to investigations of synthesis peculiarities of weakly agglomerated $La_{1-x}Sr_xMnO_3$ nanoparticles with perovskite structure by precipitation from dyethyleneglycol solution.

Obtained results show that formation of complexes between dyethyleneglycol and metal cations takes place during chemical interactions. An amorphous product is obtained after thermal decomposition of these complexes. Crystalline nanoparticles create after further heating at 600°C. Obtained nanoparticles are established to be weakly agglomerated with narrow size distribution. An average particle size is 25 – 35 nm. It was shown that magnetic fluids based on synthesized $La_{1-x}Sr_xMnO_3$ nanoparticles effectively heat under action of an alternating magnetic field (SLP=14,7 B W/g) and can be used for hyperthermia treatment.

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