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The properties of $La_{1-x}Sr_xMnO_3$ manganite nanoparticles synthesized by the precipitation from microemulsions

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Nanoparticles of ferromagnetic materials have found numerous practical applications, and one of the most promising directions is the magnetic hyperthermia – local heating the oncological tumors to 42 – 45°C under the action of an alternating magnetic field [1]. To be successfully used in hyperthermia, such particles must meet important requirements: they must be weakly agglomerated, have superparamagnetic properties and effectively heat to necessary temperatures (42-45°C) (have high specific loss power (SLP) values). In this case, heterosubstituted lanthanum-strontium manganites $La_{1-x}Sr_xMnO_3$ are of particular interest. It is possible to control their Curie temperature in the range of 20 – 70°C by changing the ratio of La^{3+} and Sr^{2+} ions, and maintain the heating temperature automatically by additional partial substitutions or by different synthesis conditions.

The aim of this study is synthesis of weakly agglomerated $La_{1-x}Sr_xMnO_3$ nanoparticles with the distorted perovskite structure by the precipitation from the reversal microemulsions based on different types of surfactants (Triton X-100, Brij-35, CTAB) and investigation of their properties.

It was shown that an amorphous product obtained after synthesis and the crystalline structure formed in one stage after further heat treatment above 600°C. Obtained crystalline particles were weakly agglomerated and had particles sizes in the range of 20 – 30 nm, and their sizes depended on the surfactants structure. Based on the synthesized nanoparticles magnetic fluids were developed, their heating efficiency in the alternating magnetic field was investigated and corresponding SLP values were calculated. It was established that the heating ability of the particles in the external magnetic field depended on the magnetization and particles morphology. Higher heating efficiency demonstrated nanoparticles synthesized from microemulsion based on CTAB (SLP = 21 W/g).

1. *Solopan S., Belous A., Yelenich A., Bubnovskaya L., Kovelskaya A., Podoltsev A., Kondratenko I., Osinsky S.* Nanohyperthermia of malignant tumors. I. Lanthanum-strontium manganite magnetic fluid as potential inducer of tumor hyperthermia // Exp. Oncol.-2011. - 33.-P. 131-135.