NANOCOMPOSITES AND NANOMATERIALS

Structural features, magnetic and resistive properties of perovskites $La_{0.5}Pr_{0.2}Pb_{0.3-x}Sr_xMnO_{3\pm\delta}$ (x= 0.05 – 0.25)

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Colossal magnetoresistive (CMR) manganites were intensively studied in last years, due to their properties and the possibility of applications as magnetoresistive sensors. Some La manganites doped with Pb exhibit interesting transport characteristics near room temperature.

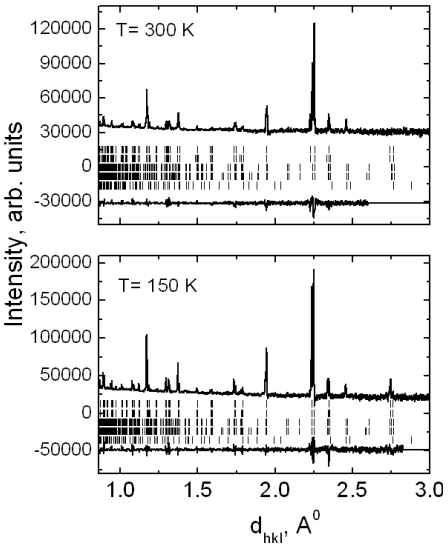

Fig.1. Diffraction patterns of the $La_{0.5}Pr_{0.2}Pb_{0.25}Sr_{0.05}MnO_3$ sample measured at the HRFD and treated with Rietveld method.

The interest for rare-earth manganites and their solid solutions $Ln_{1-x}R_xMO_3$ (where Ln - alkaline-earth: R- rare-earth and M - transition ions) is related with colossal magnetoresistive effect (CMR). CMR is observed near the phase transition "metal-semiconductor" and ferro-paramagnetic. Magnetic structure of manganites, specially the origin of magnetic frustration is probably connected with the incoherent displacement of oxygen anions, due to the different radii of A cations. This implies incoherent positions of oxygen anions also, in agreement with the Mn cations, which could lead to the stabilization of the Jahn-Teller distorted $Mn^{3+}O_6$ octahedra and the resulting random magnetic anisotropy [1]. Some La manganites doped with Pb ions exhibit interesting electrical characteristics at room temperatures.

The aim of this work is establish the influence of Pb substitution with Sr and of La with Pr on magnetic and crystalline structures and transport properties of $La_{0.5}Pr_{0.2}Pb_{0.3-x}Sr_xMnO_3$ manganites. The $La_{0.5}Pr_{0.2}Pb_{0.3-x}Sr_xMnO_3$ manganites (x=0.0 ÷ 0.20) were synthesized by ceramic technology at Laboratory of Neutron Physics, JINR, Dubna, Russia. The phase composition, lattice constants and atomic positions in crystal lattice, tolerance factor, chemical disorder degree, average length of coherent blocks and microstrains were determined by XRD and ND (time-of-flight) methods. According to X-ray data the substitution of Pb with Sr leads to important structural changes and we show that a transition from cubic to rhombohedral structure occurs for x>0.05. The investigated manganites represent a mixture between a magnetic metallic phase, until metal-insulator transition temperature, and a small amount of non magnetic insulator phase (probably as clusters). At room temperature large values of the magnetoresistance were observed for samples corresponding to x = 0.0 up to 0.15.

[1] A. Maignan, C. Martin G. Van Tendeloo, M. Hervieu and B. Raveau, *Phys. Rev. B,* **60** (1999) 15214-15219.