

Nanocomposites and nanomaterials

Mixed magnetic states in $\text{La}_{1-x}\text{Sr}_x\text{MnO}_3$ nanocrystalline samples

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Substituted manganites with perovskite structure, $\text{La}_{1-x}\text{M}_x\text{MnO}_3$, where M is an ion of alkaline or alkaline-earth elements (Na, K, Ca, Sr, Ba), attract attention due to the variety of their physical properties [1, 2]. These compounds are characterized by the complex nature of the magnetic phase transitions [1, 3]. In the nanoscale samples, the transitions may attain new features.

In this work, magnetoresistance, magnetic and resonance properties have been investigated for $\text{La}_{1-x}\text{Sr}_x\text{MnO}_3$ (LSMO) ($x = 0.15 - 0.60$) nanocrystalline samples. A special attention has been paid to electron spin resonance (ESR) studies, because this method is a powerful tool for studying the systems in which different magnetic phases coexist [3].

The LSMO solid solutions were synthesized by sol-gel method with subsequent pressing into plates with and without additional sintering. All samples are single phase and have rhombohedral $R3c$ structure. For all the samples under study, ESR investigations have revealed coexistence of different magnetic phases over wide temperature regions. Concentration dependences of the temperature of the ferromagnetic phase nucleation and the regions of the phase coexistence have been determined.

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