STUDIES OF MAGNETOSTATIC AND MAGNETORESONANCE PROPERTIES OF $La_{0.7}Sr_{0.3}MnO_3$ NANOPOWDERS

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S u m m a r y

Investigations of magnetostatic and magnetoresonance (EPR, FMR, NQR/NMR) properties of $La_{0.7}Sr_{0.3}MnO_3$ manganite nanoparticles with a linear size of 50–200 nm have been carried out. It has been shown that samples are magnetized similarly to multidomain ferromagnets and demonstrate hysteresis loops within the whole temperature range where the ferromagnetic phase exists. At the same time, the transformation of the multidomain state of a sample to a uniform one is caused by the reorientation of the magnetic moments of unidomain particles. The temperature behavior of the magnetic susceptibility of the sample in the magnetically ordered state is similar to that for superparamagnets. Such a character of the sample magnetization corresponds to the change of the latter due to the thermally activated reorientations of magnetic moments of individual unidomain nanoparticles. It is also in agreement with the presence of an additional absorption peak in the ferromagnetic resonance spectrum, which has been revealed in a narrow range in the vicinity of the zero field, where the reorientation of the magnetic moments of nanoparticles takes place. Some differences between the magnetization peculiarities of the samples fabricated by the mechanical pressing of nanoparticles and those where the particles were in the powder state have been revealed. Manifestations of both the superparamagnetism of individual nanoparticles and the influence of the dipole-dipole interaction between closely located particles in the ensemble have been observed in $La_{0.7}Sr_{0.3}MnO_3$ nanopowders while analyzing the NQR/NMR signal of ^{139}La nuclei in the internal field of ferromagnetic samples. We guess that, owing to such an interaction, closely located unidomain particles form many-particle conglomerates bound by magnetic ponderomotive forces.