VARIATION OF MAGNETIC DOMAIN STRUCTURE OF THIN MANGANITE FILM WITH TEMPERATURE

L.Uspenskaya[1], T.Nurgaliev[2], S.Miteva[2]

[1] Institute of Solid State Physics RASc, Chernogolovka, Moscow dist., 142432, Russia)
[2] Institute of Electronics BAS, София, 1784, Болгария

Thin manganite films are prospective materials for applications as possessing the resistance switching under an electric or magnetic field [1], as the ferromagnetic layer controlling the conducting properties in ferromagnet-superconductor hybrids [2], and as magnetic layer switched by electric field in ferromagnet-ferroelectric hybrids [3]. All listed above applications require the knowledge about magnetic domain structure of manganite and dynamic properties of the material. Here we presented the results of kinetics of magnetization reversal and dynamics of domain walls in 20 nm thin La0.7Sr0.3MnO3 films study performed by magnetooptic visualization technique in wide temperature range.

First, it is shown that the micro-domains with out-of-plane spontaneous magnetization are formed following zero field cooling from the Curie temperature everywhere in the film but near the twins, where prolongated domains with perpendicular magnetization are situated. Second, it is found that these small-scale domains are metastable. They are replaced by wide macro-domains with spontaneous magnetization oriented along [110] direction in the film plane after saturation by both out-of-plane and in-plane magnetic fields. Third, it was found that subsequent magnetization reversal by in-plane field occurs via the nucleation and thermoactivated motion of the 180-degree domain walls.

The dynamic parameters of domain walls were determined and their temperature stability is investegated. We have found that the motion of domain walls has thermoactivated character, determined the activation volume and activation energies of the process, dynamic coersitivity of domain walls and their maximal mobility.

Found results are discussed taking into account real defect structure in manganites and typical defects on the interface manganite-substrate.

The study is performed by the support of program of Presidium of RAS and RFBR grant.

References

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