MAGNETIC DOMAIN STRUCTURE AND COLOSSAL MAGNETORESISTANCE IN MANGANITES

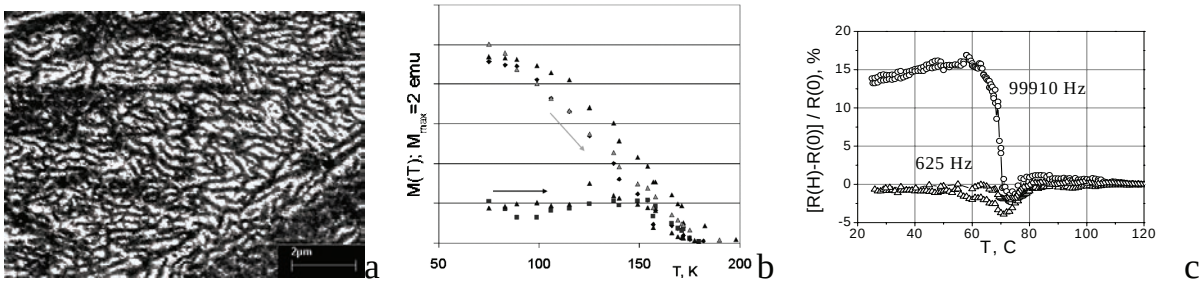
L.S. Uspenskaya[1], I. Veshunov[1], D.A. Shulyatev[2]

[1] Institute of Solid State Physics RASc, Chernogolovka, Moscow dist., 142432, Russia
[2] Moscow State Steel and Alloys Institute, Moscow, Leninskii pr-t, 4, 119991,Russia

Perovskite manganites with colossal magnetoresistance effect, exhibiting phase separation, are prospective for being employed in telecommunication as switches and logic elements and etc. Especially useful for applications is a possibility to control the properties of magnetic layer by external electric or magnetic field. Here we reported about the study of correlation between magnetic domain structure, magnetic inhomogeneities and colossal magnetoresistance effect in $La_{0.85}Sr_{0.25}MnO_3$ single crystals and about the possibility to increase the colossal magnetoresistance effect from a few to tens percent in low magnetic field.

The application of high resolution decoration technique and magneto-optic visualization technique let us to render the magnetic domain structure and magnetic inhomogeneities of the crystal, to study the variation of magnetic domain structure with temperature, to observe the disturbance of magnetic pattern by electrical current, and for the first time to find out the variation of magnetic domain structure under the current flow at resistance switching. Besides we have determined the magnetic dynamic properties of the material and have found direct correlation between them and conductive properties of manganite, which allows us to optimize the excitation of the crystal by electric field and to increase the magnetoresistance effect.

The obtained results are discussed taking into account the real magnetic domain structure, magnetic disordering, mechanisms of magnetic excitation and relaxation in manganites and domain walls excitation by scattered electrons.



a b c

Fig. 1. a - magnetic domain pattern of $La_{0.85}Sr_{0.25}MnO_3$, visualized by decoration technique, b - variation of local magnetic spontaneous magnetization in different areas of the same sample, c - colossal magnetoresistance of the sample in magnetic field ~2000 Oe measured at *ac* current ~1 ma with frequency ~625 and 99910 Hz.

The study is performed under the support by program of Presidium of RAS. We'd like to thank Dr. N.A.Tulina for stimulated discussion.