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The influence of lattice distortions on the low field magnetoresistance in bulk $La_{1-x}Me_xMnO_3$ materials

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One of the most serious problems on the way to practical application of new manganite CMR materials remains to be their insufficient magnetoresistive response at room temperature in the weak magnetic fields (<< 1 kOe), used in the most of potentially interesting devices. The growing interest of investigators to weak field effects resulted in the recent observation of tunneling magnetoresistance effect, based on the interaction of magnetic domains via thin nonmagnetic layer, not only in CMR/insulator/CMR junctions but also in polycrystalline $La_{1-x}Me_xMnO_3$ materials.

Enhanced room temperature magnetoresistance (1.5 - 2.5 % at H = 100 Oe) is observed for composites $La_{0.7}Sr_{0.3}MnO_3/SrMeO_3$ (Me = Ti, Zr) with compositions close to percolation boundary. Firing of the mixture of $La_{0.7}Sr_{0.3}MnO_3$ (LSM) and $SrMeO_3$ at T = 900 - 1200℃ results in significant interaction between constituents and in the shift of the percolation threshold to higher LSM content. The values of enhanced MR, observed near percolation boundaries, are poorly dependent on firing temperatures but differ significantly for different insulating components.

The manifestation of percolation-enhanced magnetoresistance effect in various $La_{1-x}Me_xMnO_3$ - based materials and composites is discussed in terms of lattice distortions influence on the transport properties of granular systems.