Structure and magnetic properties of $(Pr_{0.55}Ca_{0.45})(Mn_{1-y}Cr_y)O_3$ (y = 0.00, 0.03, 0.06)

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Manganese perovskites of general formula $(Pr_{1-x}Ca_x)MnO_3$ exhibit a complex phase diagram as a function of doping and temperature, characterized by a transition from a paramagnetic insulating to a charge and orbital ordered (CO) phase of the Mn^{3+} and Mn^{4+} ions in different sublattices around 220 K and by an anti-ferromagnetic transition at lower temperatures (around 170 K). The insulating state can be transformed into a metallic one by an external magnetic field. Such a magneto-conductive transition is at the basis of the so called colossal magnetoresistance effect (CMR). Because of the crucial role of the magnetic Mn site, it is interesting to study the effects of its substitution, which may provide a tool for both exploring novel CMR materials and understanding the mechanism of CMR. In this work we investigated the effect of Cr-doping.
$(Pr_{0.55}Ca_{0.45})(Mn_{1-y}Cr_y)O_3$ (with y = 0.00, 0.03 and 0.06) have been prepared by means of a solid state reaction from stoichiometric powder mixtures of binary oxides. XRPD reveals the formation of the perovskite-type compound for the whole compositions; no evidence for secondary phases may be detected. The structural refinements have been carried out using XRPD data applying the Rietveld method; the lattice parameters of the orthorhombic cell (*Pnma* space group) faintly change with composition. On the contrary the tilting of the octahedra results strongly dependent on the concentration of Cr in the 4*b* site. Bond valence sum method has been applied in order to evaluate the possible presence of lattice-induced strains; as a result the global instability index (GII) is < 0.1 v.u. and hence these crystal structures may be considered unstrained, although it has been observed an increase of GII with the Cr content. DC magnetic measurements have been performed as a function of temperature and magnetic field.