

## Magnetic ordering in the anion-deficient $\text{La}_{0.70}\text{Sr}_{0.30}\text{MnO}_{3.00-\gamma}$ manganites

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Using powder neutron diffraction method the magnetic structure of the anion-deficient  $\text{La}_{0.70}\text{Sr}_{0.30}\text{MnO}_{3.00-\gamma}$  ( $\gamma = 0, 0.15; 0.20$ ) manganites at different temperatures has been defined. It is established that the magnetic structure changes with oxygen vacancies concentration [1]. For the investigated samples the structural phase transitions have not been detected.

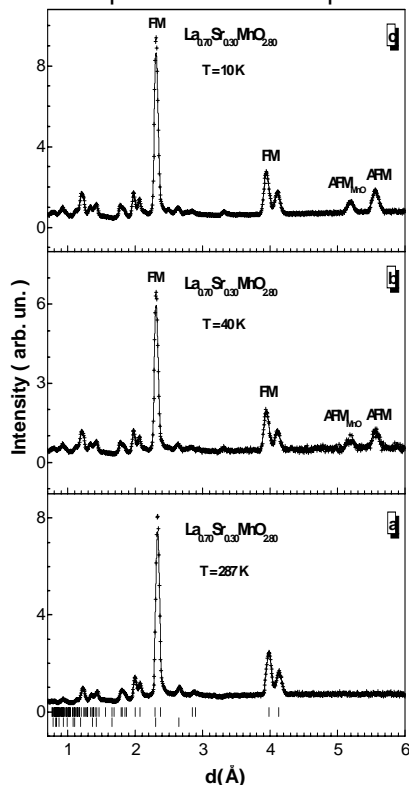


Figure 1. Neutron powder diffractograms at different temperatures for  $\text{La}_{0.70}\text{Sr}_{0.30}\text{MnO}_{2.80}$ .

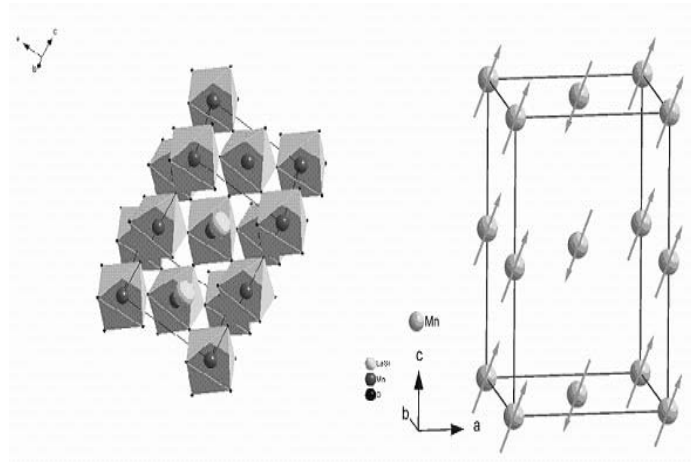


Figure 2. Schematic presentation of magnetic structure for  $\text{La}_{0.70}\text{Sr}_{0.30}\text{MnO}_{2.80}$  at room temperature.

The oxygen stoichiometric  $\text{La}_{0.70}\text{Sr}_{0.30}\text{MnO}_{3.00}$  sample is ferromagnet with  $T_C \sim 360$  K. At the  $T = 287$  K the spontaneous magnetic moment is  $M_S = 2.92(5) \mu_B/\text{f.u.}$ , whereas at the  $T = 10$  K –  $M_S = 3.53(6) \mu_B/\text{f.u.}$  [2]. The direction of the total magnetic moment is along to [110]. For the anion-deficient  $\text{La}_{0.70}\text{Sr}_{0.30}\text{MnO}_{2.85}$  sample the long-range magnetic ordering is absent for all the investigated temperatures. This sample is spin glass with the freezing temperature  $T_f \sim 45$  K [3]. For the anion-deficient  $\text{La}_{0.70}\text{Sr}_{0.30}\text{MnO}_{2.80}$  sample is detected partial long-range antiferromagnetic ordering at the  $T = 10$  K and  $T = 40$  K. At the  $T = 40$  K the spontaneous magnetic moment is  $M_S = 0.83(3) \mu_B/\text{f.u.}$ , whereas at the  $T = 10$  K –  $M_S = 0.88(1) \mu_B/\text{f.u.}$  The direction of the antiferromagnetic axis is along to [111]. The obtained data confirm the conception of the magnetic phase state forming for the Sr-doped anion-deficient manganites [4]. In according to this conception in case of orbital ordering absence the lowering of the coordination of the magnetic ion results to change of the indirect superexchange interactions  $\text{Mn}^{3+}\text{-O-Mn}^{3+}$  sign from positive to negative.

### References

- [1] S.V. Trukhanov, A.V. Trukhanov, A.N. Vasil'ev, A. Maignan, H. Szymczak, JETP Letters 85 (2007) 507–512.
- [2] S.V. Trukhanov, JETP 100 (2005) 95-105.
- [3] S.V. Trukhanov, D.P. Kozlenko, A.V. Trukhanov, J. Magn. Magn. Mater. 320 (2008) e88-e91.
- [4] S.V. Trukhanov, L.S. Lobanovski, A.V. Trukhanov, S.G. Zemskova, A.I. Beskrovniy, Phys. Stat. Sol. (c) 6 (2009) 1001-1003.