CORRELATION BETWEEN THE Cr CONCENTRATION AND MAGNETIC NANOSTRUCTURE PARAMETERS FOR $La_{0.54}Ho_{0.11}Sr_{0.35}Mn_{1-x}Cr_xO_3$ MANGANITES

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We investigated the magnetic, crystaline structure of $La_{0.54}Ho_{0.11}Sr_{0.35}Mn_{1-x}Cr_xO_3$ (x=0.05, 0.20) manganites. The synthesis of investigated manganites was performed by starting from La_2O_3 and Ho_2O_3 (purity: 99.99%), $SrCO_3$ and the Mn and Cr acetates (purity: 99.00%) [1]. The phase composition, structure, lattice constants, positions of cations and anions in unit cell, BO distances, BOB bond angles, average size of mosaic blocks and microstrains were determinate by using Fullprof or PowderCell code. Neutron diffractometry was used to obtain corresponding data (s. Fig. 1).

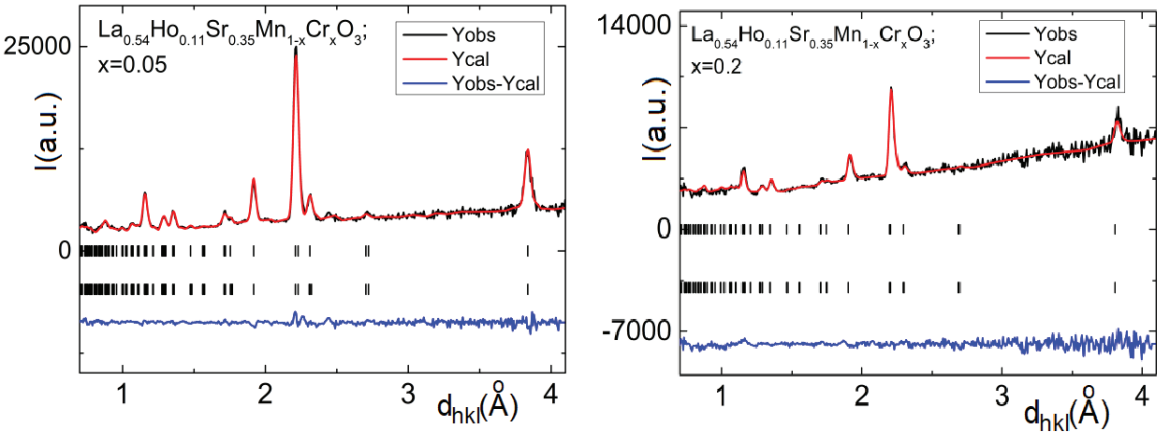

Figure 1. Refined powder neutron diffraction pattern at 300 K. Continuous lines represent observed (black line), calculated (red) and difference (blue) patterns. Tick markers correspond to the position of the allowed Bragg reflections: first rows (above) are the crystal reflections and second rows (below) are the magnetic reflections of $La_{0.54}Ho_{0.11}Sr_{0.35}Mn_{1-x}Cr_xO_3$ with the space group R-3c

Table 1. Variation of the lattice constants (a, b, c), unit cell volume (V), average size of mosaic blocs (D) and microstrains (ε) for $La_{0.54}Ho_{0.11}Sr_{0.35}Mn_{1-x}Cr_xO_3$ manganites (two phases model, R-3c phase and Pnma parameters)

x	a (Å)	b (Å)	c (Å)	V (Å^3)	D (Å)	ε	SG
0.05	5.469_8	5.469_8	13.449_3	348.48	457	0.00215	R-3c
0.20	5.473_3	5.473_3	13.434_4	348.54	641	0.00249	R-3c
0.05	5.500_6	7.705_0	5.459_5	231.39	989	0.000175	Pnma
0.20	5.502_0	7.705_5	5.461_4	231.54	1004	0.000204	Pnma

Lattice constants change due the modification of cations distribution, with the increase of the Cr concentration in the samples. We supposed that cations distribution is characterized by the presence of the Mn^{3+} (HS - 0.645 Å), Mn^{4+} (0.53 Å), Cr^{3+} (0.615 Å), Cr^{2+} (0.80 Å) in various concentrations.