Structural properties of mixed magnetic oxide determined from synchrotron powder diffraction

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Atomic structure and microstructure of two series of spinel ferrite $NiFe_{2-x}Cr_xO_4$ (with x = 0.7 and 0.9) and perovskite $La_{2/3}Pb_{1/3}Mn_{1-x}Co_xO_3$ (with x = 0, 0.20, 0.25 and 0.30) have been investigated by synchrotron powder diffraction method. On applying the full pattern fitting of Rietveld method using FullProf program, unit cell dimensions, atomic positional parameters, ion occupancy and microstructure (coherent scattering region and microstrain) of the samples have been determined.

For the ferrite spinel $NiFe_{2-x}Cr_xO_4$, the result showed that all investigated compounds were phase pure. The crystal structure symmetry of the compounds was confirmed to be cubic (space group Fd3m). The change of Cr content in the samples leads to the variation of their atomic structure, microstructure and cation distribution.

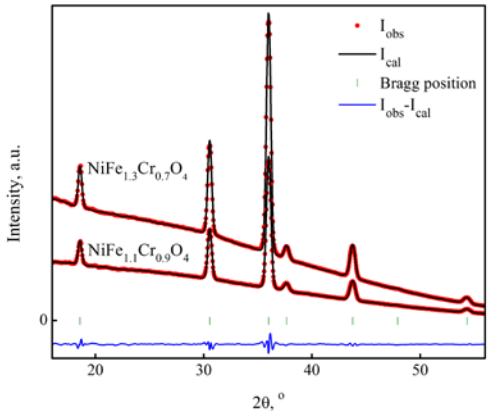

Fig. 1. Diffraction pattern for $NiFe_{1-x}Cr_xO_4$ measured in SLRI at T =300 K (λ = 1.5499 Å) and processed by the Rietveld method.

For the samples $La_{2/3}Pb_{1/3}Mn_{1-x}Co_xO_3$, our result shows that all the compounds are described by slightly distorted perovskite like structure with rhombohedral symmetry (sp. gr. R-3c). The lattice parameters and bond distances Mn/Co – O are typical of rhombohedral manganites. Only negligible changes of samples microstructure with composition were observed. The correlation of structural character of these compounds with their fundamental properties was confirmed.

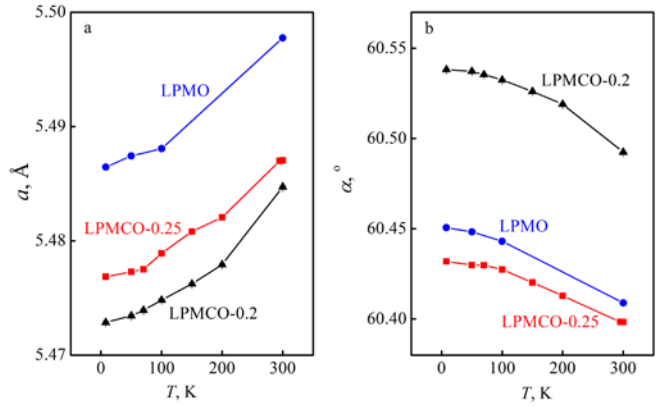

Fig. 2. Temperature dependence of unit cell parameters a (fig. 2.a) and α (fig. 2.b) of the samples $La_{2/3}Pb_{1/3}Mn_{1-x}Co_xO_3$