Thermal behaviour of $Sm_{0.5}R_{0.5}FeO_3$ (R = Pr, Nd) probed by high-resolution X-ray synchrotron powder diffraction

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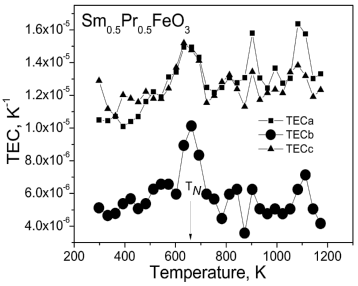
Mixed ferrites $Sm_{0.5}Pr_{0.5}FeO_3$ and $Sm_{0.5}Nd_{0.5}FeO_3$ were synthesized by conventional solid state reaction technique in air at 1473 K for 20 h. Lattice parameters at room temperature are in good agreement with the end members of the $SmFeO_3$–$PrFeO_3$ and $SmFeO_3$–$NdFeO_3$ systems, thus proving formation of continuous solid solutions $Sm_{1-x}Pr_xFeO_3$ and $Sm_{1-x}Nd_xFeO_3$, respectively. Thermal behaviour of $Sm_{0.5}Pr_{0.5}FeO_3$ and $Sm_{0.5}Nd_{0.5}FeO_3$ structures have been studied *in situ* in the temperature range of 298–1173 K by means of high-resolution X-ray synchrotron powder diffraction technique. Corresponding experiments were performed at synchrotron laboratory *HASYLAB/DESY* (Hamburg, Germany). As it was established, both compounds remain orthorhombic in the whole temperature range investigated. No structural phase transitions were detected. Thermal expansion of $Sm_{0.5}Pr_{0.5}FeO_3$ and $Sm_{0.5}Nd_{0.5}FeO_3$ shows nonlinear anisotropic behaviour: the thermal expansion coefficients (TEC's) in *b*-direction is twice lower compared to *a* and *c* directions (Figure).



Lattice parameters of $Sm_{0.5}Pr_{0.5}FeO_3$ exhibit an anomalous kink around 670 K, witch is reflected in clear maxima at the TEC's curves (Figure). This observation is obviously indicative for a magnetoelastic coupling at the magnetic ordering temperature T_N, similar to recently reported for $SmFeO_3$ [1].

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1. *C.-Y. Kuo, Y. Drees, M.T. Fernández-Díaz, L. Zhao, L. Vasylechko et al.* k=0 magnetic structure and absence of ferroelectricity in $SmFeO_3$ // Phys

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