implying that YCrO_3 became more distorted with increasing pressure. The polyhedral bulk moduli for YO_12 and CrO_6 polyhedra led to: \( V_{poly}^{\text{bulk}} \cdot K_0' \): 46.09(2) \( \text{A}^3 \), 254(2) GPa for YO_12, and 10.40(1) \( \text{A}^3 \), 251(5) GPa for CrO_6. The volume compressibilities of the YO_12 and CrO_6 sites are therefore equivalent. That results are different to those previously reported for the orthorhombic YAO_3 perovskite in which the \( b \)-axis is significantly more compressible than both \( c \) and \( a \) [4]. Considering the elastic moduli of both YCrO_3 and YAO_3, the two structures under pressure show a different anisotropic behavior along \([101]\) (both YCrO_3 and YAO_3 structures). Furthermore, for the YAO_3 perovskite the compressibility of the A site is \( \sim 15\% \) less than that of the AlO_6 octahedron [4]. Such contrasting trends can be explained by the stronger confinement of Y ions in YAO_3 due to the smaller size of octahedral network in the orthoaluminate compared to the orthochromate. As known from previous work [3], the decrease of mean octahedral bond distance, \(<\text{B-O}>\), from YCrO_3 to YAO_3 is accompanied by shortening of the average \(<\text{A-O}>\) distance and decreasing of interpolyhedral tilting. The associated strong confinement of Y cation in YAO_3 does not occur in YCrO_3. Here the A site is easier to compress and does not hamper the enhance of octahedral tilting and rotation expected at high pressure conditions.


Keywords: perovskites, synchrotron powder diffraction, high pressure.

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Pressure-Induced Phase Transformations in Lead-based Relaxor Ferroelectrics. B. J. Maier\(^a\), R. J. Angel\(^b\), B. Mihaïlova\(^c\), W. G. Marshall\(^d\), C. Paulmann\(^e\), J. M. Engel\(^f\), M. Gospodinov\(^c\), U. Bismayer\(^c\).

\(^a\)Department Geowissenschaften, Universität Hamburg, Germany. \(^b\)Department of Geosciences, Virginia Tech, USA. \(^c\)Rutherford Appleton Laboratory, Harwell Science and Innovation Campus, UK. \(^d\)Institut für Werkstoffwissenschaft, Technische Universität Dresden, Germany. \(^e\)Institute of Solid State Physics, Bulgarian Academy of Sciences, Bulgaria.

E-mail: maier.bernd@mineralogie.uni-hamburg.de

The structural peculiarities of relaxor ferroelectrics, exhibiting very high dielectric and elastoelectric response, remain a challenging problem. Pressure is a strong driving force that can trigger incipient atomic clusters existing at ambient conditions to develop into long-range ordered domains detectible by conventional diffraction methods. Thus, the analysis of pressure-induced transformation processes can help to elucidate the structural complexity of relaxors. Our high-pressure X-ray diffraction data on lead scandium tantalate (PST) and lead scandium niobate (PSN) as well as doped variants reveal a thermodynamically second-order phase transition for all compounds [1,2]. An increase in the intensities of \( h,k,l \) = all odd reflections is observed while the intensity of \( h,h,p \) peaks, \( h = 2n+1 \), does not change with pressure. This indicates a glide-plane pseudo-symmetry of the structural distortion along the \( <111> \) cubic directions and unambiguously reveals anti-phase octahedral tilting as the cause for the increased reflection intensities. Rietveld refinements to neutron powder diffraction data on PST and PSN reveal anti-phase octahedral tilts already below the critical pressure that continuously evolve with pressure [3]. The high-pressure phase has either or symmetry, depending on whether the presence of 1:1 cation ordering is neglected or taken into account. The influence of Ba\(^2+\), Bi\(^3+\), and La\(^3+\) substitution for Pb\(^2+\) on the phase transition will be discussed. Ba\(^2+\) smears out the phase transition and enhances the local ferroic distortion, while Bi\(^3+\) lowers the critical pressure and enhances the structural distortions associated with the phase transition. La\(^3+\) substitution for Pb\(^2+\) yields a smaller tolerance factor, thus octahedral tilting occurs already at room pressure, although the average structure remains metrically cubic.


Keywords: Ferroelectrics and Related Materials, High-pressure Phase Transitions, X-ray and Neutron Diffraction
variations at high temperature are mainly induced by the rafting process which is basically due to stress assisted diffusion controlled process. Rafting/directional coarsening in single crystal superalloys is strongly controlled by the sign of applied stress, lattice misfits between and elastic constants of $\gamma/\gamma'$ phases and varies with service temperature due to the different thermal expansion coefficients of these phases. The elastic anisotropy of LEK94 can be interpreted by a quasi-single crystal composite consisting of a single crystalline $\gamma$ matrix with coherently distributed precipitates of well oriented $\gamma'$ crystallites.

The microstructure of superalloys can be manipulated to obtain different microstructures by altering heat treatments and creep deformation conditions allowing variation in the amount and size distribution of $\gamma'$ precipitates in order to improve the overall fatigue lifetimes. The main aim of our work is therefore to investigate the correlation between the anisotropic elastic behavior of LEK94 and the evolution of its microstructure in order to optimize modeling and characterization of the thermal fatigue response of this material.


**Keywords**: elastic properties, microstructure evolution, fatigue