MS27-05 | Phase Transitions in Zr-Rich Lead Zirconate-Titanate Studied by Single Crystal Diffuse and Inelastic X-Ray Scattering

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Lead zirconate-titanate ($PbZr_{1-x}Ti_xO_3$, PZT) is a piezoelectric perovskite material, which possesses ferroelectric as well as antiferroelectric properties. Thanks to high piezoelectric coefficient PZT is broadly used in many electronic devices [1].

For PZT with $0 < x < 0.06$ antiferroelectric phase is stable at room temperature. This phase has an orthorhombic structure resulting from antiparallel displacements of lead ions and opposite rotations of ZrO_6 octahedrals for the neighboring layers of paraelectric cubic perovskite structure [2]. Thus, phase transition into the antiferroelectric phase is associated with condensation of two phonon modes with different symmetry. In paraelectric phase dielectric measurements [3] revealed critical divergence of dielectric constant, which could be associated with ferroelectric mode instability in Brillouin zone center. There is ferroelectric intermediate phase in-between the antiferroelectric and paraelectric phases. Electron diffraction indicates that the intermediate phase has incommensurate modulated structure [4], however, the symmetry of this phase is still not well understood.

To study microscopic mechanism resulting in PZT phase transitions the measurements of single crystal diffuse and inelastic X-ray scattering in PZT with $0.007 < x < 0.04$ have been performed. In the present contribution, the relevant critical dynamics accompanying phase transitions in Zr-rich PZT will be discussed using obtained results.

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