MS44-O3 Mapping of reciprocal space with ferroelectrics under electric field

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Ferroelectric materials are widely used for piezoelectric applications. These materials show strong enhancement of electromechanical properties close to a solid state phase transition point or morphotropic phase boundary. Mapping of reciprocal space is a perfect tool to characterize the composite nature of the materials, in-situ measurements under electric field allow to see the ferroelectrics in action and provide a ground for understanding of microscopical mechanisms underlying macroscopic behavior. A compact setup for single crystal E-field diffraction experiments in a transmission mode has been recently developed [1]. Temperature and electric field evolution of diffraction patterns, both Bragg and diffuse, for PMN-PT and PIN-PMN-PT ferroelectrics studied with new setup indicates that the compounds predominantly consist from a twinned monoclinic phase. Role of lattice strain and ferroelectric domains is discussed on the basis on experimentally measured total diffraction response. Further development of the method implies a combination of dielectric spectroscopy with large volume reciprocal space mapping of diffuse and Bragg scattering.

[1] Vergentev T Yu, Dyadkin V and Chernyshov D Yu J. Surf. Invest. X-ray Synchrotron Neutron Tech. 9 436 (2015)

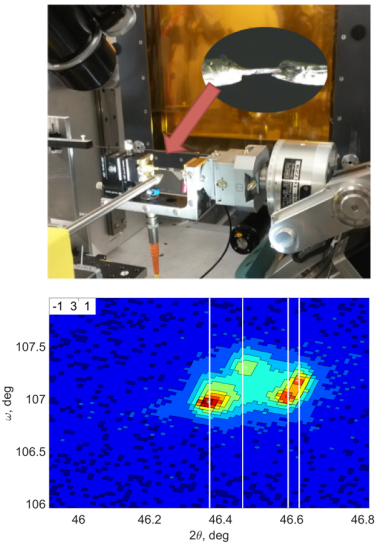

Figure 1. Top: The cell for the electric fields diffraction experiments. The single crystal sample is fixed between two needle contacts with conducting glue (insert). Bottom: a splitting of [-1 3 1] pseudo-cubic node for PMN-33PT ferroelectric indicative for a monoclinic phase.

Keywords: reciprocal map, ferroelectrics, electric field