Mapping of Optical Anisotropy and Strain in Ferroelectric Crystals via Single-Shot Spectroscopic Polarimetry

Stanisław Chełkowski#, Krzysztof Dorywalski

Institute of Experimental Physics, Faculty of Mathematics Physics and Informatics, University of Gdańsk – Gdańsk, Poland

In this contribution, we present the concept and realization of a low-cost, automated birefringence microscope designed for real-time quantitative imaging of optical anisotropy parameters ($|sin(\delta)|$), optical axis azimuth φ, and transmission I_0.

Unlike classical polarimetric setups (e.g., Metripol-type systems) [1], where determining the polarization state requires the mechanical rotation of optical components and sequential frame acquisition, the developed device utilizes a camera equipped with a micro-polarizer mosaic array (DoFP – *Division of Focal Plane*). This enables the simultaneous measurement of four light intensity components in a single exposure (*single-shot*), effectively eliminating motion artifacts and allowing for smooth, "live" previewing of the measured physical quantities. Integrating the optical path with a monochromator enables the investigation of the spectral dependence of birefringence.

The application potential of the system was demonstrated through the quantitative analysis of macroscopic inhomogeneities and internal strain fields (growth striations) in a $Sr_{0.4}Ba_{0.6}Nb_2O_6$ (SBN-40) ferroelectric relaxor crystal.

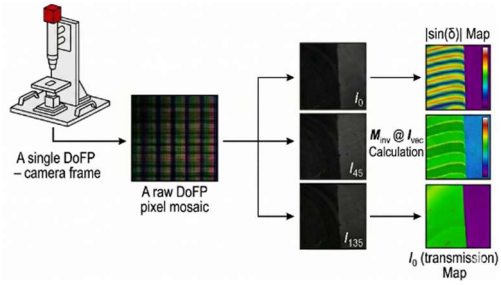

Figure 1. Data acquisition and processing flow of the single-shot polarimeter

[1] A. M. Glazer, J. G. Lewis, and W. Kaminsky, "An automatic optical imaging system for birefringent media," *Proc. R. Soc. Lond. A*, vol. 452, no. 1955, pp. 2751–2765, 1996.

corresponding author: stanislaw.chwlkowski@ug.edu.pl