INFLUENCE OF MULTIPLE INTERNAL REFLECTION AND SAMPLE THICKNESS CHANGE EFFECTS ON DETERMINATION OF POLYMER FILM EO COEFFICIENTS USING MZI TECHNIQUE

E. Nitišs[1], M. Rutkis[2], M. Svilāns[3]
[1]Institute of solid State Physics, University of Latvia, Ķengaraga iela 8, LV 1063 Riga, Latvia, edgarsn@cfi.lu.lv
[2]Institute of solid State Physics, University of Latvia, Ķengaraga iela 8, LV 1063 Riga, Latvia, martins.rutkis@cfi.lu.lv
[3]Faculty of Material Science and Applied Chemistry, Rīga Technical University, Āzenes 14.24, LV-1048, Rīga, Latvia, mikelis@ktf.rtu.lv

New nonlinear optical (**NLO**) active organic materials have shown to be appealing candidates for optoelectronic and photonic technologies. For the evaluation of new NLO polymer materials for applicability for mentioned technologies, the most important criteria are their electrooptic (EO) coefficients. We have implemented the Mach – Zehnder interferometric (MZI) method for determination of EO coefficients of thin organic films.

Despite the fact that there are known multiple other optical methods for determination of thin film EO coefficients, MZI method is chosen because this particular technique has high sensitivity to phase and intensity modulations in the sample arm and allows to determine independently both thin film EO coefficients - r_{13} un r_{33}. After realization of this method at the Laboratory of Organic materials we have found several drawbacks described earlier in literature [1]. In addition to those we demonstrate that some other effects like electrostriction and multiple internal reflections in the sample have huge influence on modulation depth values. Taking into account these effects we have performed numerical simulations of the EO modulation depth at different incidence angles using Abeles matrix formalism. We can show that the modulated signal in the MZI is highly dependent of the sample structure and is mainly governed by the effects mentioned above. For analysis of modulated signal components and determination of EO coefficients of thin polymer film, series of experiments were carried out on PMMA+DMABI 10wt% samples.

Keywords: EO effect, Mazh-Zehnder interferometer, Abeles matrix formalism

1. M. Aillerie, N. Theofanous, Measurement of the electro-optic coefficients: description and comparison of the experimental techniques, *Appl. Phys*. B 70, (2000), p. 317.–334.

Acknowledgements
This work has been supported by ERDF project (agreement No. 2010/0308/2DP/2.1.1.1.0/10/APIA/VIAA/051).