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# Optic and quasi-optic investigations of nanocrystalline structures

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Recently many researchers have paid a lot of attention to the study of various nanoporous matrices with liquid crystals as well as solid state crystalline materials filled in their nanopores. Nanocrystalline stuctures that were formed in such a way have shown interesting properties [1-3] from fundamental and applied perspectives. In particular, in [3] we have proposed a technique to study these structures and the efficiency improvement of their possible application as working elements in electro- or nonlinear optical devices. It is worth mentioning [4] the presence of anisotropy of optical properties in host nanoporous matrices as well as in nanoporous matrices with anisotropic crystalline materials in their nanopores. This is the primary goal of our research.

To perform the necessary research we have acquired nanoporous materials made of $Al_2O_3$ by SmartMembranes (Germany) with the thickness of 0.1 mm and the diameter of pores ranging from 20 to 80 nm. In order to fill the nanopores of these matrices different liquid or solid state crystals were used. Experiments can be carried out on previously developed interferometric-rotating setups for optical (wavelength 0.6328 μm [5]) and for quasi-optical (wavelength 1÷10 mm [6,7]) measurements. The proposed method for measuring thin plates has the advantage because it is the only method of measuring the refractive indices (RI) for the case when the electromagnetic wave polarization is perpendicular to the plate surface.

We have modified the setup for RI measurements on nanocrystalline structures in visible wavelength range. For this purpose, brushless drives based on synchronous machines with permanent magnets were developed. These drives allow the rotation of investigated samples at ultra-low speeds with an option of high-precision positioning. Also, a new algorithm for data processing, including recording and filtering was developed. Using modified setups, RI for different light polarization will be measured on mentioned nanostructures and the anisotropy of such structures will be analyzed.

1. Atrashchenko A. V. et.al, *Phys. E Low-dimensional Syst. Nanostructures*, **44** (2012) 1324
2. Grigas A. et.al, *Beilstein Journal of Nanotechnology*, **2** (2011) 28
3. Andrushchak A.S. et.al, *Proceedings of TCSET'2014 conference*, Lviv, 2014, 347
4. Belotitskii V. I. et.al, *Tech. Phys. Lett.*, **36** (2010) 957
5. Andrushchak A.S. et.al, *Optics & Lasers in Engineering*, **46** (2008) 162
6. Andrushchak N.A. et.al, *Microw. Opt. Technol.Lett*, **53** (2010) 1193.