Project description

Propagation properties of 1D self-organizing optofluidic photonic structures dedicated for a mid-infrared spectral region

A self-creating one dimensional photonic crystal based on gold nanoparticles suspended in a nematic liquid crystal (Fig. 1) may allow the design and fabrication of spectrally adjustable optofluidic photonic devices with a broad tuning range. This self-assembly process is completely reversible and can be controlled by modifying the diameter of the confining space. The period of the observed self-organizing periodic structure depends on the capillary diameter and varies in the range from 10 to even 60 mm. Additionally, the system is characterized by high refractive index contrast as the refractive index changes between the nematic phase and the isotropic phase. It makes this structure a good candidate for being one of the component of systems intended for a mid-infrared spectral (MIR) region. Therefore, the principal aim of the proposed project is to **investigate propagation properties of one dimensional optofluidic photonic crystal based on nanoparticles suspended in a nematic liquid crystal matrix**. In particular, reflection characteristics of the obtained structure will be examined depending on the capillary diameter, type and birefringence of nematic liquid crystal used and type of nanoparticles.

Implementation of the project will enable the understanding of the mechanisms responsible for mid-infrared spectral region light propagation within the newly discovered material and simultaneously to control the whole process. The discovered periodic structure characterized by selective reflection within the MIR wavelength range can be used to build optical devices, such as low-power-consuming tunable filters or reflectors, light shutters, or electrically controllable intensity modulators.

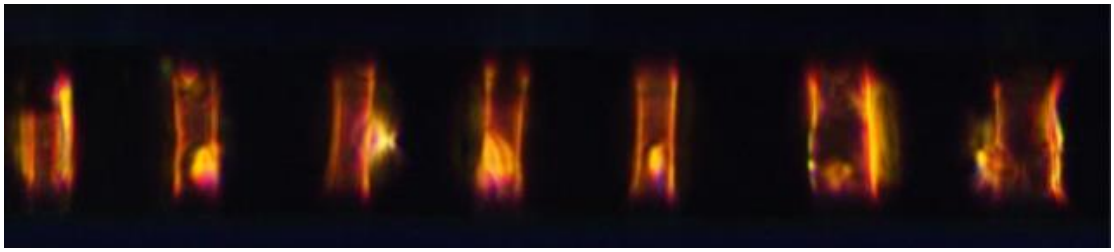

Fig. 1. One dimensional photonic crystal in nematic liquid crystal doped with gold nanoparticles in a capillary with a 60 μm diameter