Nanooptics and nanophotonics

Angular shaping of fluorescence spectra by photonic crystal

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Photonic crystals are of great interest for the study of light propagation in periodical structures and changing the optical properties of species infiltrated in their pores [1]. Photonic crystal consisting of closely packed silica globules with diameter in the range of 240 – 260 nm were used in our experiments. Such sample has own visible fluorescence caused by the recombination of excitons localized near the oxygen defects in silica lattice. We showed that spectral shape of the defect-related fluorescence is strongly dependent on the photonic stop band caused by the periodic arrangement of silica globules in the photonic structure. The spectral position of the peak reflectance corresponds to the minimum of fluorescence (Fig. 1). An increase of the detection angle causes a blue shift of the photonic dip in the fluorescence spectra. This provides interesting prospects for the shaping of emission spectra of organic molecules (such as DNA) infiltrated into the pores of the photonic crystal. It can be useful for the fluorescence-based optical sensing techniques and for controlling the radiative decay of fluorescent molecules. This work was done with support from Marie Curie ILSES project No. 612620 and Russian-Ukrainian project 27-02-14.

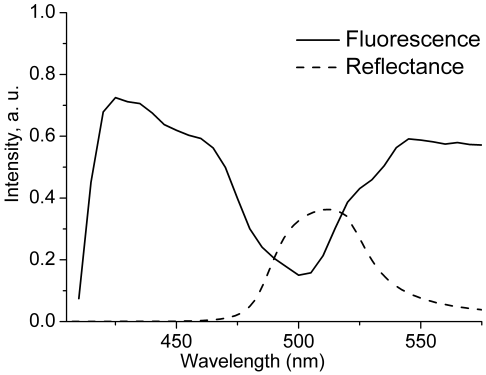

Fig.1. Spectra of fluorescence (λ_{exc}=266 nm) and reflectance of the silica photonic crystal.

1. *Boiko V. et al.* Luminescent imaging of biological molecules and cells on the photonic crystal surface // Nanomaterials imaging techniques, surface studies and applications, Eds. Fesenko O., Yatsenko L., Brodin M., Springer Proceedings in Physics. – 2013. – **146**. – P. 253-262.