

Photon Crystal Defect Mode in 1D Photonic Crystal Terminated by a Metal Film for Using in Sensorics

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Nowadays, plasmon-polariton photodetectors and optochemical sensors are widespread in different fields of science, medicine and industry. This is a stimulus for an active research to enhance the working characteristics of these systems (sensitivity, selectivity, geometric specification etc.).

The excitation of photon crystal defect mode can be realized in the case of the photonic crystal (PhC) terminated by a metal film. The position of this defect mode highly depends on geometrical and optical properties of the PhC and its boundaries [1]. In this work we study the active plasmon-polariton devices based on Schottky barrier that is united with the 1D PhC deposited on the top of a periodically profiled thin metal film located on semiconductor substrate (1D PhC/Au/GaAs).

The modeling of light transmittance through multi-layered structure with periodically profiled metal film in the framework of the differential formalism is presented in the figure 1 for varied thickness of the front layer of 1D PhC that can be base of selectively sensitive layer. The 1D photonic crystal is based on Bragg mirror consisting of repetition of sequence of two dielectric films with refractive indices, n_1, n_2 ($n_1=1.47, n_2=2$) and thicknesses, d_1, d_2 , that equal to quart-length of photonic band gap (we chose 700 nm) in corresponding media. The geometrical parameters of texturized metal (gold) film with correlated sine profiles are a period of 700 nm, a thickness of 50 nm and a profile depth of 50 nm. The defect mode of 1D PhC is located inside PhC band gap (600-900 nm) and rapidly blue-shifted at decreasing of the thickness of first layer of 1D PhC.

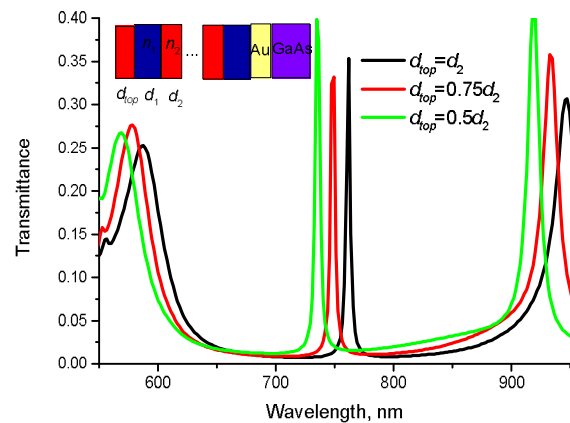


Fig.1. Calculated transmittance of *p*-polarized light through multilayered plasmonic-photonic structure based on Schottky barrier (1D PhC/Au/GaAs) for varied thicknesses of front 1D PhC layer.