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Detection of Viruses and Bacteria Using a New Defected Triple Photonic Crystal Biosensor

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Abstract

In this study, biosensors based on dielectric/metal/dielectric triple photonic crystals containing a defect layer (sample) were proposed. With assumed parameters such as some triple photonic crystal layers, the refractive index of samples and viruses, the thickness of photonic crystal, metal and, defect layers, and also by selecting the appropriate wavelength area, the transmittance matrix of the system is calculated, then transmittance is simulated as a function of wavelength. The simulations show good results for $N=3$ periodic layers, with 150 nm dielectric layer and 5000 nm defect layer thicknesses. Also, among the four metals gold, silver, copper, and aluminum, the intensity of the transmission spectrum of copper and the FWHM of gold was the highest. The simulation of the standard sample and samples infected with viruses and microbes show that the sensitivity of this structure increases almost linearly in the higher wavelength regions and is more favorable than the lower wavelength regions. Compared to similar biosensors, this structure has a high sensitivity for the low number of photonic crystal layers and the low thickness of the samples.

Keywords: photonic crystals, biosensors, viruses, bacteria, refractive Index

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