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Electromagnetic wave propagation through a graphene-based photonic crystal OLEG BERMAN, VLADIMIR S. BOYKO, ROMAN YA. KEZERASHVILI, New York City College of Technology, City University of New York — A novel type of photonic crystal formed by embedding a periodic array of constituent stacks of alternating graphene and dielectric discs into a background dielectric medium is proposed [1]. The frequency band structure of a 2D photonic crystal with the square lattice of the metamaterial stacks of the alternating graphene and dielectric discs is obtained. The electromagnetic wave transmittance of such photonic crystal is calculated. The graphene-based photonic crystals have the following advantages that distinguish them from the other types of photonic crystals. They can be used as the frequency filters and waveguides for the far infrared region of spectrum at the wide range of the temperatures including the room temperatures. The photonic band structure of the graphene-based photonic crystals can be controlled by changing the thickness of the dielectric layers between the graphene discs and by the doping. The sizes of the graphene-based photonic crystals can be much larger than the sizes of metallic photonic crystals due to the small dissipation of the electromagnetic wave. The advantages of the graphene-based photonic crystal are discussed.

[1] O. L. Berman, V. S. Boyko, R. Ya. Kezerashvili, A. A. Kolesnikov, and Yu. E. Lozovik, Phys. Letts. A 374, 4784 (2010).

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