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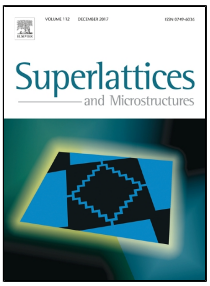

Wideband absorption in one dimensional photonic crystal with graphene-based hyperbolic metamaterials

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Wideband absorption in one dimensional photonic crystal with graphene-based hyperbolic metamaterials

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Abstract

A broadband absorber which was proposed by one dimensional photonic crystal (1DPC) containing graphene-based hyperbolic metamaterials (GHMM) is theoretically investigated. For TM mode, it was demonstrated to absorb roughly 90% of all available electromagnetic waves at a 14 terahertz absorption bandwidth at normal incidence. The absorption bandwidth was affected by Fermi energy and thickness of dielectric layer. When the incident angle was increased, the absorption value decreased, and the absorption band had a gradual blue shift. These findings have potential applications for designing broadband optoelectronic devices at mid-infrared and THz frequency range.

Keywords: absorption; photonic crystal; graphene-based hyperbolic metamaterials.

1. Introduction

Recently, broadband high absorption efficiency has attracted much attention for various technological applications such as solar cell, plasmonic detectors, and efficient thermal emitters [1-4]. Graphene, a two-dimensional honeycomb monolayer structure, has been shown to possess a variety of outstanding optical and electronic properties [3,5,6]. It has been demonstrated that the absorptivity of an undoped graphene single sheet is only 2.3%. In recent years, more and more people have