Photonic Band Structure Formed By Moirè Patterns for Terahertz Applications

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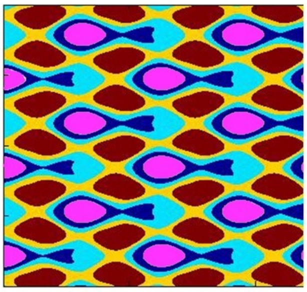
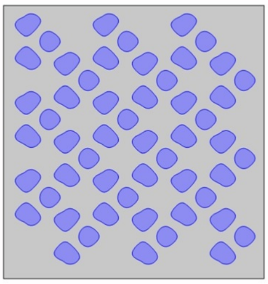
Abstract

Photonic crystals (PhCs) are the periodic arrangement of dielectric structures in one, two and three dimensions offer unprecedented control of light including inhibition of spontaneous emission, negative refraction, self-collimation and confinement. Due to the advent of three-dimensional printing technique, one can explore variety of geometrical structures for novel control of light. In this work, we have realized a photonic crystal formed by Moirè patterns. Moirè patterns are the contours of trigonometric functions (Fig.1(a)), which gives additional degrees of freedom to mould light radiation. Band structure of the proposed PhC, derived out of the Moirè pattern (Fig. 1(b) and Fig. 1(c)) is obtained using Finite-element methodology based electromagnetic solver COMSOL® RF Module accompanied with Matlab. The material geometry is implemented through Matlab and imported to COMSOL® RF Module for eigenfrequency analysis to get the photonic bandstructure. The properties of proposed Phcs are explored for realizing Terahertz optical devices such as cavity resonators and waveguide channels.

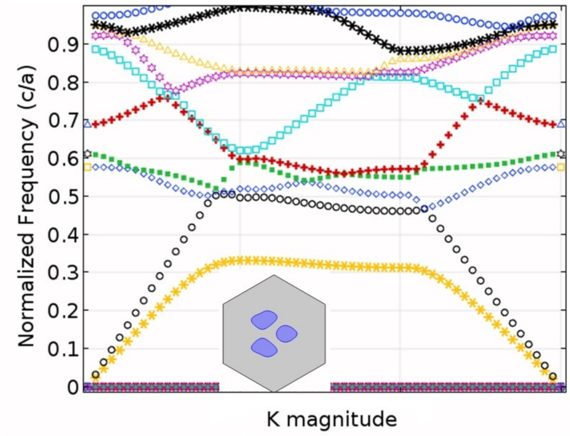
Figures used in the abstract



(a) Moirè Pattern



(b) Photonic Crystal from Moirè Pattern



(c) Photonic band structure of Moirè PhC. Unit cell is given in inset.

Figure 1