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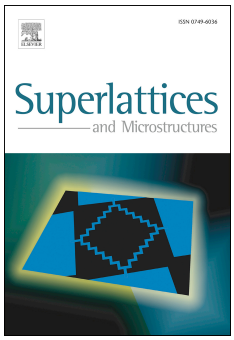

Optical absorption in planar graphene superlattice: The role of structural parameters

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Optical absorption in planar graphene superlattice: the role of structural parameters

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Abstract

We theoretically studied the optically driven interband transitions in a planar graphene superlattices (PGSL) formed by patterning graphene sheet on laterally hetrostructured substrate as Sio_2/hBN. A tunable optical transitions between minibands is observed based on engineering structural parameters. We derive analytically expression for optical absorption from two-band model. Considerable optical absorption is obtained for different ratios between widths of heterostructured substrate and is explained analytically from the view point of wavefunction engineering and miniband dispersion, in details. The role of different statuses of polarization as circular and linear are considered. Our study paves a way toward the control of optical properties of PGSLs to be implemented in optoelectronics devices.

Keywords: Planar Graphene superlattice(PGSL), hetrostructured substrate, optical transitions, optical absorption, effective Dirac equation.

1. Introduction

Graphene, an atomically thin 2D material, has attracted considerable interests due to its superior electrical and optical properties[1-3] and has been emerged as a revolutionary new material for nanoelectronics and nanophotonics[4-6]. A variety of condensed matter phenomena have been realized in graphene such as Klein tunneling[7-8], ballistic charge transport[9],[13-14], and minimum conductivity[3].

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