60.

Accession Number

12067531

Author

Zhou Y. Wu MW.

Author/Editor Affiliation

Zhou Y. Wu MW. : Department of Physics, University of Science and Technology of China, Anhui, Hefei 230026, China

Title

Optical response of graphene under intense terahertz fields

Source

Physical Review B (Condensed Matter and Materials Physics), vol.83, no.24, 15 June 2011, 245436 (14 pp.). Publisher: American Physical Society, USA.

Abstract

Optical responses of graphene in the presence of intense circularly and linearly polarized terahertz fields are investigated based on the Floquet theory. We examine the energy spectrum and density of states. It is found that gaps open in the quasienergy spectrum due to the single-photon and multiphoton resonances. These quasienergy gaps are pronounced at small momentum, but decrease dramatically with the increase of momentum, and finally tend to be closed when the momentum is large enough. Due to the contribution from the states at large momentum, the gaps in the density of states are effectively closed, in contrast to the prediction in the previous work by Oka and Aoki [Phys. Rev. B 79, 081406(R) (2009)]. We also investigate the optical conductivity for different field strengths and Fermi energies, and show the main features of the dynamical Franz-Keldysh effect in graphene. It is discovered that the optical conductivity exhibits a multi-steplike structure due to the sideband-modulated optical transition. It is also shown that dips appear at frequencies being the integer numbers of the applied terahertz field frequency in the case of low Fermi energy, originating from the quasienergy gaps at small momentums. Moreover, under a circularly polarized terahertz field, we predict peaks in the middle of the "steps" and peaks induced by the contribution from the states around zero momentum in the optical conductivity. (70 References).