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Publication date:
2013

Citation (APA):
Andryieuski, A., Pizzocchero, F., Booth, T., Bøggild, P., & Lavrinenko, A. (2013). Graphene Based Terahertz Absorber Designed With Effective Surface Conductivity Approach. Abstract from 7th International Conference on Materials for Advanced Technologies (ICMAT 2013), Suntec, Singapore.

Graphene Based Terahertz Absorber Designed With Effective Surface Conductivity Approach

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Young field of terahertz (THz) science and technology demands new materials and devices, such as filters, modulators, polarization converters and absorbers. Graphene, a recently discovered single-atom-thick material, provides exciting properties for functional terahertz applications. Graphene is flexible and ultrastrong mechanically, transparent for optical radiation, with high electrical conductivity that can be tuned by electrochemical potential. Structured graphene layers constitute metamaterials that can provide tunable and very unusual electromagnetic properties.

In this contribution we present the description of graphene metamaterial properties through the effective surface conductivity. Such description is very convenient, as it simplifies the design of THz devices, and very natural, since surface conductivity can be measured directly in experiment. We show how to extract the effective conductivity and how to use it in optical design.

We demonstrate a tunable THz perfect absorber, which consists of continuous graphene various structured graphene metamaterials above a metal mirror. Changing the Fermi level from 0 eV to 0.5 eV allows for drastic changes in absorbance from less than 0.1 to 1 in the working range. We demonstrate the possibility of the absorber bandwidth control with the metamaterial's unit cell geometry.

The results of fabrication and characterization of the THz graphene metamaterials based absorbers will be presented at the conference.