Graphene based nanostructures for detecting terahertz radiation

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Recently there has been increased interest in the so-called terahertz electromagnetic radiation (from 10^{11} to 10^{13} Hz). This is primarily due to the emergence of new approaches to the creation of sources and detectors of radiation in this range. Efficient detection of THz radiation is still a challengeable task. Increase in the sensitivity of the THz radiation detectors range can be achieved by reducing the size of the sensor element. Graphene is an almost ideal material for creating nanoscale structures that are suitable for this purpose. One of the major advantages of graphene is its high carrier mobility and the associated large coherence length, so that the band structure is determined by the size quantization and can be controlled via the geometry of the structure.

Several more or less successful configurations of detectors of THz radiation on the basis of graphene and nanotubes have been proposed recently [1-5]. Further improvement of this type of device is not possible without better understanding of the mechanisms that determine the magnitude of the response to radiation.

In this talk I will present the results of our systematic studies of different configurations of detectors with sensor elements based on graphene as well as its derivatives – carbon nanotubes (CNTs) and graphene nanotubes (GNRs). The asymmetry that is crucial for the observation of the DC voltage response to the radiation has been implemented in our devices in two different ways. In the first case different metals are used to contact the channel. In the second the gate electrode is coupled to the radiation.

The data allow us to determine the most promising directions of development of the technology of nanocarbon structures for the detection of THz radiation.

This work was supported by the RFBR under project N 15-02-07787

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