PHOTOCONDUCTIVITY OF GRAPHENE WITH TITANIUM NANOPARTICLES

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The zero band gap in graphene and the independence of the amount of light absorption from the wavelength in a wide spectrum makes graphene a promising material in photonic applications [1]. For example, silicon-based photodetectors are limited to a wavelength of about 900 nm due to its band gap of 1.1 eV. In addition, single-layer graphene demonstrates a high optical absorption coefficient (7×10^5 cm^{-1}) in a wide range from 300 to 2500 nm, which is much higher than that of conventional semiconductor materials [2]. At the same time, the two-dimensional structure of graphene allows to control its absorption coefficient by varying the number of layers or by functionalizing its surface with elements with varying degrees of light absorption. This quality of the two-dimensional material opens up promising prospects for the use of graphene in various optical devices such as LEDs, solar cells, photocatalysts, biosensors and photodetectors.

This work is devoted to the study of the photoconductivity of graphene functionalized by titanium nanoparticles. The experiments were carried out on graphene, the synthesis by the CVD method of which is described in detail in [3]. The conductive contacts were made by magnetron sputtering and consisted of an adhesive layer of titanium and a layer of copper. Nanoparticle coating of the graphene surface took place in the mode of pulsed sputtering of a titanium target with times up to 10 seconds. As a result, the dependence of the graphene structure on the sputtering time of the titanium target is obtained. Thus, the application of titanium nanoparticles by magnetron sputtering to the graphene surface makes it possible to increase its photoconductivity.

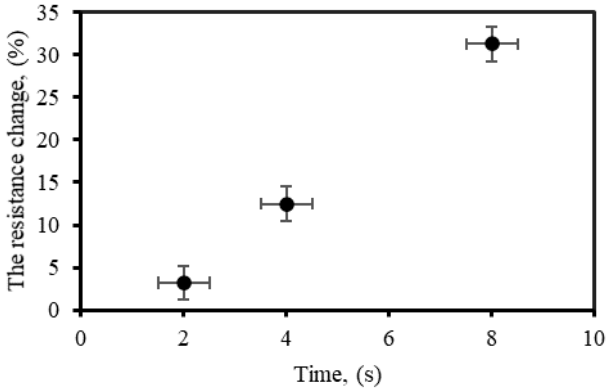

Fig.1. Dependence of graphene resistance change on the sputtering time of titanium nanoparticles.

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