Functionalization approach for tuning of electronic structure of CVD-graphene

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Here we present an effective approach for changing the electronic structure of graphene using the non-destructive method: non-covalent functionalization of graphene [1], in other words, by the deposition of various substances on the graphene, such as crystals of iron chloride and cobaltocene and oxygen molecules. This method allows you to configure the electronic structure of graphene and give it either electronic or hole type conductivity. Firstly, the method of functionalization by gas-phase deposition of substances on the surface of graphene was demonstrated in this work, secondly, a change in the electronic structure of graphene was confirmed using a set of measuring methods, thirdly, it was shown that the hole type of conductivity in graphene is much more stable, than electronic, and can be easily obtained by spontaneous deposition of oxygen molecules (adsorption) on the surface of graphene.
Using optical absorption spectroscopy and Raman spectroscopy, a change in the optical properties of graphene after functionalization was demonstrated. By measuring the Seebeck coefficient, sheet resistance and field-effect transistor characteristics, a change in the electronic structure of graphene was observed. The work clearly demonstrated the interaction of graphene with the air atmosphere and the creation of a lateral p-n junction using local oxygen desorption and adsorption.

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References

[1] M. Rybin, V. Islamova, E.A. Obraztsova, and E.D. Obraztsova "Modification of graphene electronic properties via controllable gas-phase doping with copper chloride" // Applied Physics Letters 112, 033107 (2018).