Effective approach for graphene electron structure characterization

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The paper presents a simple and effective approach for analyzing the electronic structure of graphene using a combination of two methods: measuring sheet resistance and measuring the thermoelectric effect (Seebeck coefficient). To use graphene in microelectronics or optoelectronic devices, it is necessary to know its electronic structure. As you know, graphene is a material with a zero bandgap and its Fermi level is located at the contact points of the valence and conduction bands. However, particles are adsorbed from the atmosphere on graphene, due to charge transfer, the Fermi level of graphene changes, and after thermal annealing in vacuum, particles can be desorbed. Thus, the Fermi level of graphene is very sensitive to surface charge. This paper presents the results of the synthesis of graphene by chemical vapor deposition with transfer of graphene onto a dielectric substrate and the modification of its properties by the deposition of molecules from the gas phase. Iron chloride was used as an electron acceptor, and cobaltocene as an electron donor, shifting the Fermi level in graphene to either the valence or conduction bands, respectively. In the course of the work, the graphene surface was functionalized and its electrophysical characteristics were measured. Charts were built to quickly determine the electronic structure of graphene and the position of its Fermi level.

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FIGURES

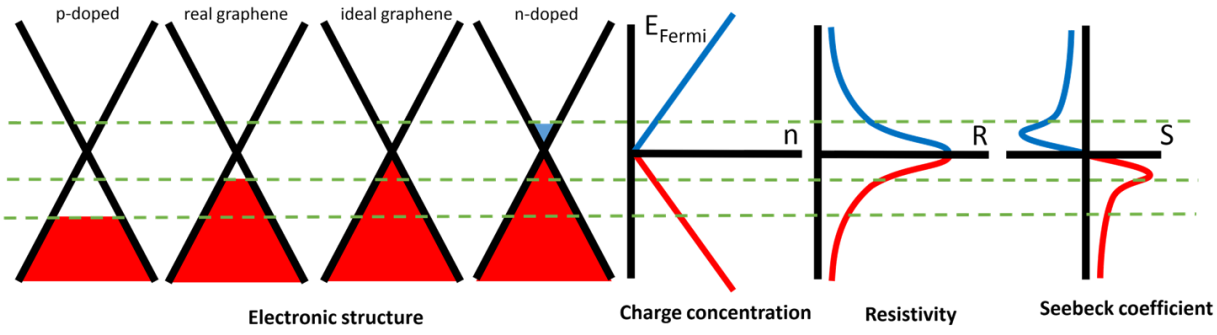

Figure 1: Scheme of electronic structure of graphene and its electronic characteristics vs Fermi energy.