Properties of carbon nanotube based devices. Intrinsic vs contact phenomena.

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Properties of semiconductor electronic devices are largely determined by the contact phenomena. This is most clearly evident in the case of structures with reduced dimensionality. Full description of the processes occurring at the semiconductor-metal requires complex calculations, so the construction of semi-empirical approaches for their modeling is of great interest. Carbon nanotubes (CNTs) are an ideal model object to explore the rich physics of nanoscale semiconductor devices. The introductory part of the report is devoted to the basic properties of devices based on individual CNTs and, in particular, how the electrostatic doping modifies their transport characteristics. One of the unique features of the CNT is the ability to customize its band structure in a controlled manner with the magnetic field. In my presentation, I will explain how to use this effect was to build a simple and effective model for calculating transport properties of CNT devices, taking into account contact phenomena at the interface of CNT / metal. It will be shown how the developed approach could be applied to the modeling of CNT devices as gas sensors and detectors of terahertz electromagnetic radiation.

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