Angle resolved photoelectron spectroscopy as the method for investigation of electronic structure of graphene

Popova A.A.*, Shikin A.M., Rybkin A.G.

St. Petersburg State University, 198504, St. Petersburg, Russia
**e-mail: popova.anna@bk.ru*

Photoelectron spectroscopy (PES) is one of the modern methods for investigation of occupied electronic states of solids. The photoeffect is the basic effect of this method. Electron in an occupied state can be excited to unoccupied state by photon. If the energy of photon $\hbar\omega$ is larger than a work function of solid some electrons can leave a solid and then can be registered. Using of the synchrotron radiation is prevailing last time. Ultrarelativistic charged particle motion in the storage ring leads to the synchrotron radiation which allows achieving of monochromatic radiation with a high energy resolution and a high intensity during registration of photoelectron energy distribution [1,2].

Angle resolved photoelectron spectroscopy (ARPES) is widespread method for measurement of dispersion dependences and symmetry of energy bands of solid. Basically this method has a conservation of parallel to the surface component of quasimomentum of photoelectron when overcoming the potential barrier. We can investigate features of the electronic structure of graphene when measuring dispersion dependences of electronic states in different directions of surface Brillouin zone. In the present time the only feasible route towards large-scale production of graphene is epitaxial growth on a substrate. The presence of the substrate will influence on the electronic properties of graphene layer. And the electronic structure of such graphene will differ from the one of ideal freestanding graphene with such distinctive features as linear dispersion dependences of π-states of graphene near the K point of the Brillouin zone of graphene and a location of Dirac point (the crossing point of cones of occupied and unoccupied electronic states) at the Fermi level.

[1] S. Hufner. Photoelectron spectroscopy: principles and applications. - Berlin Heidelberg: Springer-Verlag, 1995.

[2] Shikin A.M. Interaction of photons and electrons with the solid state, St. Petersburg, VVM, 2008 (in Russian).