

Field electron emission from carbon nanotubes and graphene

Field emission (FE) is the emission of electrons from the surface of a condensed phase under the action of high electrostatic fields. During the past two decades, the interest to FE was triggered by discovery of new types of carbon nanostructures with high aspect ratios, such as carbon nanotubes and graphene. These nanocarbons have strong sp² interatomic bonding and corresponding high mechanical strength, chemical inertness, high thermal and electrical conductivity which provide high stability of the emission current. The large aspect ratios of nanocarbons provide high enhancement of the electrical field and possibility to use relatively low voltages. This attracts great attention to the production of cold cathodes from nanocarbon materials for vacuum electronics. At the same time, FE measurements may be used as an original characterization tool for analysis of surface properties of carbon materials. Moreover, the mechanism of FE from carbon nanotubes and graphene may be different from the classical mechanism of emission from macroscopic emitters due to unusual electronic properties of nanocarbons. In this talk I will present the basics of the FE phenomenon, including FE properties of nanometric emitters and multi-emitter cathodes, as well as the original results on the study of FE from the cathodes based on carbon nanotubes and graphene.