ABSTRACT

The point contact is a tiny metallic bridge of nanometer size connecting bulk electrodes. The study of nonlinear conductivity of point-contact constitutes a base of point-contact spectroscopy [1]. This is a powerful method to illuminate the point-contact electron-quasiparticle interaction function, $\alpha^2_{\text{PCF}}(\omega)$, and to study different quasiparticles (for example, phonons and magnons), crystal electric field excitations, paramagnetic impurities, two-level systems, etc. Also, due to Andreev reflection point-contacts between superconductors and normal metals are used to determine and investigate the superconducting order parameter. In this talk I first review, briefly, the physical principles of spectroscopy of quasi-particle excitations in metals at low temperatures by point contacts, and describe various experimental techniques for point contact preparation. In the body of the talk I discuss recent highlights in point-contact investigation of two band superconductor MgB2, AF magnetic nickel borocarbide superconductor HoNi2B2C, and skutterudite PrOs4Sb12. Point contacts are an appropriate tool to study different phenomena in conductivity at nanometer scale and high current density. Some examples of nontrivial features in conductivity of point contacts will be presented.