

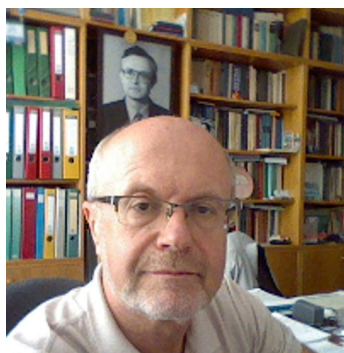


Weekly Seminar

Point-contact spectroscopy: discovery, development and application

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Time: 4:00pm, Oct. 18, 2017 (Wednesday)

时间: 2017年10月18日 (周三) 下午4:00

Venue: Room W563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

Point-contact spectroscopy (PCS) [1], discovered by Prof. Igor Yanson in 1974, plays an important role in the investigation of metallic materials. PCS provides information about the energy resolved interaction of conduction electrons with other quasiparticles in solids, namely, about electron-phonon and electron-magnon interaction, crystal-electric-field excitations, Kondo scattering and so on. It turns out, that the second derivative of current-voltage $I(V)$ characteristics of ballistic (and diffusive) point contacts contains straightforward information as to the electron-phonon interaction (EPI) function $\alpha^2F(\omega)$ which is responsible for the many transport properties of metals. On the other hand, EPI is a “glue” for electrons to form superconducting Cooper pairs and the knowledge of EPI function $\alpha^2F(\omega)$ is of great importance to elucidate the nature of superconductivity. It is unique that the important parameters of superconductors like energy gap Δ can be measured with the same point contacts driven into the superconducting state utilizing, so-called, point-contact Andreev-reflection spectroscopy. Thus, information about the superconducting gap Δ and EPI function $\alpha^2F(\omega)$ can be obtained simultaneously using PCS.

In my talk, I will introduce the basics of PCS method and will present recent achievements as to using of PCS to investigate the normal and superconducting state properties of recent and emergent materials as magnesium diboride, nickel-borocarbide and iron-based superconductors.

[1] Yu. G. Naidyuk and I. K. Yanson, *Point-Contact Spectroscopy*, Springer (2005).

About the speaker

Prof. Yu. G. Naidyuk received his Bachelor's degree from Kharkiv State University in 1976. Thereafter, he became a permanent member of the research staff of B. Verkin Institute for Low Temperature Physics and Engineering (ILTPE) of the National Academy of Sciences (NAS) of Ukraine. He obtained Ph.D. degree under Prof. Igor Yanson supervision in 1982 and in 2001 he received the next degree of Doctor of Science. He was awarded the title of Professor in 2011. Yu. G. Naidyuk is head of the department of Point Contact Spectroscopy at ILTPE since 2011. Yu. G. Naidyuk was awarded by Young Scholar Ukrainian State award (1984), B. Verkin Prize of the NAS of Ukraine (2005) and State Prize of Ukraine in Science and Technology (2015). He was Humboldt Research Fellow during 1994-1995 and carried out research at the Physical Institute University of Karlsruhe (Germany). Yu. G. Naidyuk conducted research at many European research centers, among them are Universities in Cologne, Darmstadt and Wuerzburg (Germany), Turku (Finland), Royal Institute of Technology (Stockholm, Sweden), Leibniz Institute for Solid State and Materials Research Dresden (Germany), CNRS-High Magnetic Field Lab (Grenoble, France), Institute of Experimental Physics (Kosice, Slovakia), TAMUniversity (College Station, USA). Yu. G. Naidyuk is author or co-author over 100 peer-reviewed papers, two review papers and the book “Point-contact spectroscopy” (ed. by Springer). The main scientific interest of Yu. G. Naidyuk is connected with application of point-contact spectroscopy to investigate new and emergent materials. In the last time among them are nickel-borocarbide superconductors and magnesium diboride, systems with strong electronic correlation as heavy-fermion compounds and iron-based superconductors etc.