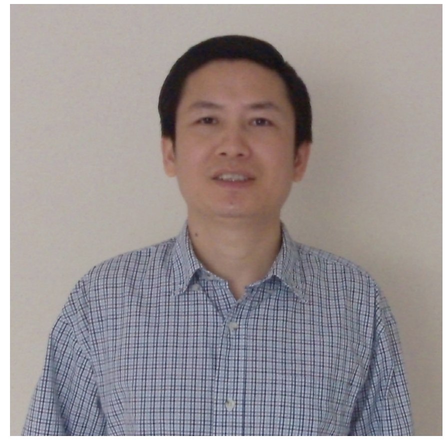
T_CSUH Bi-Weekly Seminar

Texas Center for Superconductivity at the University of Houston



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Andreev reflection spectroscopy in uniquely designed nano-scale normal metal/ superconductor devices featuring $Fe_{1+y}Te_{1-x}Se_x$

Friday, November 18, 2011
Room 102, University of Houston Science Center
12:00 Noon – 1:00 p.m.

Abstract

Iron-based superconductors have been attracting enormous interest since 2008 because of their high transition temperatures and intriguing physical mechanisms involving superconducting (SC) and magnetic orders. Iron chalcogenide, the 11 family with simple crystal structure and multiple Fermi pockets, provides a unique platform for investigating the pairing symmetry. Previously, a sign reversal of the SC gap function was reported for $Fe_{1+y}Te_{1-x}Se_x$, in line with theoretical speculation of a possible s± pairing symmetry resulting from interband coupling via spin fluctuations. However, the number of SC gaps, another key issue for understanding the pairing, remains elusive. Concrete evidence for multiple SC gaps has not been obtained in $Fe_{1+y}Te_{1-x}Se_x$ by scanning tunneling microscopy or conventional point-contact spectroscopy in a “needle-anvil” technique (most commonly adopted for the fabrication of point contacts). In this talk, I will discuss efforts of my group in establishing a distinct experimental method to implement Andreev reflection spectroscopy with diagnostic capability in uniquely designed nano-scale normal metal/superconductor (N-S) junctions, revealing multiple SC gaps in $Fe_{1+y}Te_{1-x}Se_x$ and their evolution as a function of both the temperature and magnetic field. We expect this experimental approach to be widely applicable for the study of various types of superconductors in future, in particular considering the thermal and mechanical stability and the diagnostic information provided by this method.

Bio

Haibing Peng obtained his B.E. from Tsinghua University in 1996, M.S. from Institute of Physics, Chinese Academy of Sciences in 1999 (graduated as a recipient of the Presidential Special Award), and PhD from Harvard University in 2004. He has been an assistant professor at University of Houston since Sep 2007, after performing postdoctoral research at UC Berkeley. His current research foci are graphitic nano-structures and unconventional superconductors, on which his group has reported the observation of a few distinct electron transport phenomena. Prior to joining UH, his work on carbon nanostructures and complex oxide materials has led to extensive publications including 8 first-author papers (2 in Phys. Rev. Lett., 4 in Appl. Phys. Lett. and 2 in Phys. Rev. B), which have been cited 315 time as of Aug 2011 (ISI record). He is also an inventor of 3 US patents, 1 China patent, and two pending US patent applications.

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