THE CHINESE UNIVERSITY OF HONG KONG

Department of Physics

SEMINAR

Enhancement of Superconductivity in Cuprate Homologous Series

by

Dr. Xiao-Jia CHEN (陳曉嘉博士)
Geophysical Laboratory
Carnegie Institution of Washington, US

Date: February 23, 2009 (Monday)
Time: 1:30 - 2:30 p.m.
Place: L5, Science Centre, CUHK

ALL INTERESTED ARE WELCOME
****

Abstract

Currently, there is a great interest in finding a way to achieve higher transition temperature *Tc* of a superconductor than it already has. Copper-oxide high-temperature superconductors (HTSCs) remain the superconducting materials having highest *Tc*'s both at ambient condition and under pressure. In a given family of these superconductors, *Tc* rises with the number of CuO_2 layers, reaching a peak at $n = 3$, and then declines. In addition, *Tc* varies among different compounds from one superconducting series to other series. There is evidence for the coexistence of antiferromagnetism and superconductivity in multilayer HTSCs which possess two crystallagraphically inequivalent CuO_2 planes in unit cell. We have demonstrated that the *Tc* difference from family to family is the result of different next nearest neighbor hopping, while its difference between the compounds in a homologous series is controlled by the interlayer coupling strength together with the charge imbalance of two structurally equivalent CuO_2 planes. We also have discovered a remarkable *Tc* enhancement in a trilayer Bi-based cuprate by pressure-driven phase competition, providing the first evidence of superconductivity in the inner CuO_2 plane. Our results point to a way to make higher *Tc* through the suppression of antiferromagnetic phase in the inner CuO_2 plane and the optimization of two competing energy scales (pairing and phase ordering) of different CuO_2 planes, which have important implications for designing and engineering superconductors with much higher *Tc*'s at ambient conditions.

Enquiries: 2609 6339