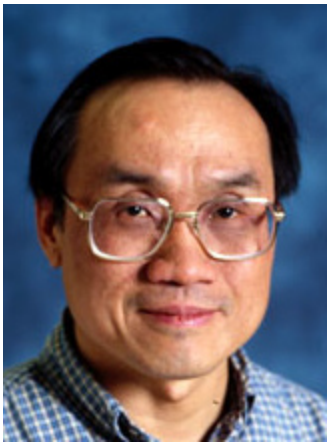
T_CSUH Bi-Weekly Seminar

Texas Center for Superconductivity at the University of Houston



Prof. Pei-Herng Hor

Associate Professor of Physics and Project Leader,
Novel Materials Research,
Texas Center for Superconductivity

Friday, Feburary 1, 2008
Room 102, University of Houston Science Center
12:00 noon – 1:00 p.m.

The Unified Electronic Phase Diagram of High T_c

Abstract

I will discuss the construction of a unified electronic phase diagram (UEPD) by analyzing various characteristic temperatures and energies of high-T_c cuprates using a dimensionless universal hole-doping concentration (p_u). There are three converging characteristic temperatures (T^*'s) and their corresponding energies (E^*'s) as p_u increases in the underdoped regime. T^*'s and E^*'s merge together with the $T_c(p_u)$ and $3.5k_BT_c(p_u)$ curves at $p_u \sim 1.1$ in the overdoped regime, respectively. They finally go to zero at $p_u \sim 1.3$. The UEPD follows an asymmetric half-bell-shaped T_c-curve in which T_c appears at $p_u \sim 0.4$, reaches a maximum at $p_u \sim 1$, and rapidly goes to zero at $p_u \sim 1.3$. The asymmetric UEPD curve is at odds with the well-known symmetric superconducting dome for $La_{2-x}Sr_xCuO_4$ in which two characteristic temperatures and energies that converge as p_u increases and merge together when T_c goes to zero at $p_u \sim 1.6$,. The unified phase diagram clearly shows that pseudogap is necessary for high temperature superconductivity. I will discuss some universal intrinsic properties of high-T_c that can be easily understood in terms of the UEPD.

Persons with disabilities who require special accommodations in attending this lecture should call (713) 743-8210 as soon as possible.

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