

TCSUH Special Seminar

Texas Center for Superconductivity
at the University of Houston

Dr. Shuheng H. Pan

Boston University,
Department of Physics



“Impurities and Inhomogeneities in the High Tc Superconductor $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ ”

Wednesday, February 7, 2001

3:00 p.m. — 4:00 p.m.

Room 102, Houston Science Center

Abstract

I will show the manifestations of a microscopic electronic “inhomogeneity” in the optimally doped high-Tc superconductor $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+x}$ using scanning tunnelling microscopy/spectroscopy (STM/S). We observe strong spatial variations in the local density of states (LDOS) spectrum independent of the sample quality and fabrication method. We find that both the integrated LDOS and the superconducting energy gap exhibit Gaussian-like distributions. They are strongly cross-correlated with each other in space and vary on surprisingly short length scales characterized by auto-correlation decay lengths of ~ 14 . More remarkably, these amplitude correlation decay lengths are smaller than the measured in-plane superconducting coherence length χ_{ab} , but coincide with the average spacing of the oxygen dopants. Our observations suggest that these local electronic variations are directly associated with the spatial distribution of the individual oxygen dopant atoms. This microscopic picture emerging from our findings may lead to a deeper understanding of high-Tc superconductivity.

Dr. Shuheng H. Pan is an associate professor of physics at Boston University. He earned his B.S. in physics in 1981 from Soochow University, Suzhou, Jiangsu, China; and his Ph.D. in 1991 from the University of Texas at Austin.

Upon completion of his studies in Austin, he served as a postdoctoral research fellow with the Institute of Physics at the University of Basel in Switzerland.

Following his fellowship in 1993, Dr. Pan worked for two years each with the Institute of Applied Physics at the University of Hamburg and the Center for Ultra Low Temperature Physics at the University of California, Berkeley.

Dr. Pan's research interest is in applying scanning probe techniques to characterize electronic properties of novel materials.

His current research primarily concentrates on using low temperature STM to study high Tc superconductors and carbon nanotubes.

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