

# T<sub>c</sub>SAM Bi-Weekly Brown Bag Seminar

Texas Center for Superconductivity and Advanced Materials



**Prof. W. P. Su**  
Department of Physics and T<sub>c</sub>SAM  
University of Houston

## “Theory of Inhomogeneous High-Temperature Superconductivity”

**Thursday, January 27, 2005**

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

### Abstract

Inhomogeneity is a hallmark of the high-temperature superconductors as evidenced by many experiments. A natural interpretation of that can be found in a phenomenological model of d-wave superconductivity, which is an extended Hubbard model with onsite repulsion and nearest-neighbor attractive interaction. This model gives rise to a phase diagram which is strikingly similar to the observed one in the cuprates. A central result of the model is that below a critical doping concentration, the system is unstable with respect to phase separation between the antiferromagnetic state and the d-wave superconducting state. Such a state has a vanishing compressibility, therefore it is easily rendered inhomogeneous by the random dopant potentials.

As a microscopic origin of the intersite attractive force, a tight-binding version of the Little’s exciton model has been examined. Quantum Monte Carlo calculations indicate that the purely repulsive interaction between conduction electrons and exciton electrons (electronic polarization) can indeed induce phase separation and superconductivity, where are manifestations of the intersite attractive force.

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

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