T_CSUH Special Seminar

Texas Center for Superconductivity at the University of Houston

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New Properties in Old Materials: Doped Layered Dichalcogenides

Change of Date and Time to Monday, Oct. 22 at 4:00 p.m.

~~**Friday, October 19, 2007**~~
Room 102, University of Houston Science Center
~~12:00 noon – 1:00 p.m.~~

Abstract

Transition metal dichalcogenides MX_2 (M is transition metal, X = S, Se, or Te) have long been known and explored. Due to their reduced dimensionality, such compounds sometimes display charge density wave (CDW) transitions, which are periodic modulations of the conduction electron density. In addition, the CDW state is believed to compete with a superconducting state (SC), both the CDW and the SC representing collective electron states induced by Fermi surface instabilities. Upon doping with various complexes, the transition metal dichalcogenides often reveal dramatic changes of their physical properties. I will discuss the effects of transition metal intercalation on the properties of two layered chalcogenide materials, $TiSe_2$ and TaS_2. Although $TiSe_2$ is one of the first known CDW-bearing materials, the nature of its CDW transition remains controversial. Recently the interest in $TiSe_2$ has been renewed by our discovery of the new superconducting state SC that emerges upon Cu doping. Thus Cu_xTiSe_2 provides the first example of a system in which controlled chemical doping can be used to study the competition between the CDW and SC. I will also discuss experiments on Fe_xTaS_2 aimed at studying the sharp switching of the magnetization that we recently observed in this compound for x = 1/4. For this particular Fe content, Fe_xTaS_2 orders ferromagnetically below 160 K and displays very sharp hysteresis loops in the ordered state for H||c. This is indicative of a very rapid switch of the magnetization direction, and the time dependence of this magnetization switch reveals unexpected time dependence.

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

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