量子材料科学中心

International Center for Quantum Materials

Seminar

Dimer-breaking and electronic correlation in ThCr2Si2 structure compounds

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Time: 4:00 pm, Mar. 17. 2011 (Thursday)

时间：2011年3月17日 （周四）下午4:00

Venue: Conference Room A (607), No. 5 Science Building

地点：理科五号楼607会议室

Abstract

With over 600 members, the tetragonal ThCr2Si2 structure is the most commonly observed structure among the intermetallic compounds. This AT2X2 structure is formed by stacking covalently bonded transition metal-metalloid T2X2 layers, made from edge-sharing TX4 tetrahedra, with ionic A atoms (Fig. 1). In certain members of this AT2X2 family, a molecule-like X-X dimer crosses the A atom layer, pulls the neighboring T2X2 layers closer together, leading to what are known as collapsed tetragonal (cT) cells. In contrast, the absence of an X-X dimer results in uncollapsed tetragonal (ucT) cells. A unique lattice collapse transition from ucT phase to cT phase, albeit noted 20 years ago, has rarely been examined until very recently. In this talk, I will show my exploration of solid solutions between the ucT and cT phases. Continuous lattice collapse transitions can be controlled by tuning the chemical pressure or changing the electron filling in the X-X antibonding orbitals. Exotic magnetic properties, such as quantum critical point (QCP) and high temperature ferromagnetism, unexpectedly develop during the course of the dimer breaking. The use of chemical bond breaking as a tuning parameter to induce QCP opens an avenue for designing and studying novel magnetic materials.