DEPARTAMENTO DE FÍSICA FUNDAMENTAL

Structural Instabilities and Superconductivity

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More than 24,000 inorganic compounds are known. Of these compounds approximately 16,000 are binary or pseudobinary while about 8,000 are ternary or pseudo-ternary. Certainly, it is surprising that in many of them the physical properties have never been explored. In the studied compounds the observation of strong correlated states from magnetic ordering or superconductivity is a rare phenomenon. Evidences have shown that phase transitions can be supported by instabilities, incipient or arising from structural transformation. Specifically, for superconductors the BCS theory, with Eliashberg microscope ingredients, has been successful to explaining the structural dependence. In point of fact, electronic order is very sensible to lattice and fluctuation on phonon spectrum. For example, normal diborides ZrB_2 and HfB_2 exhibit Pauli paramagnetic at low temperatures. However, the partial substitution in $M_{1-x}V_xB_2$ (M = Zr and Hf) generates distortions in the crystal lattice with dramatic changes in density of state and phonon structure, able of inducing bulk superconducting. In this intriguing scenario, our discussion deals about of synthesis and characterization of unexplored set of superconductors compounds.

Día: Martes 30 de octubre de 2018
Hora: 13:00 horas
Lugar: AULA IV (TRILINGÜE)