Notre Dame Science
Department of Physics

MANIPULATING Tc IN Fe-BASED SUPERCONDUCTORS THROUGH DOPING AND INTERLAYER COUPLING

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4:00 P.M. ❖ 118 NSH
(Refreshments at 3:30 P.M. NSH 202)

Searching for new superconductors and determining the key factors impacting Tc are at the core of research in superconductivity. Recently, Fe-based superconductors, the second high temperature superconductor family besides the cuprates, have been discovered to show Tcs up to 55 K. The interplay of the magnetism, superconductivity and structure in Fe-based superconductors makes them a great platform for understanding unconventional superconductivity. First, the temperature-dopant concentration (T-x), temperature-extra electrons (T-e), and temperature-pressure (T-P) phase diagrams of the Ba(Fe1-xTMx)2As2 series will be presented. Quantitative analysis shows that there exists a limited range of electron counts for which superconductivity can be stabilized if the structural and magnetic phase transitions of the parent compound BaFe2As2are sufficiently suppressed. Furthermore, the Tc on the underdoped side can be related to the suppression of the structural / magnetic phase transition, while Tcmax on the overdoped side is determined by the electron concentration. Second, the crystal structures and properties of two structurally and chemically similar Fe based superconductors, Pt doped Ca10(Pt3As8)(Fe2As2)5 (the “10-3-8 phase”) with highest Tc around 11 K, and Ca10(Pt4As8)(Fe2As2)5 (the “10-4-8 phase”) with the highest Tc around 38 K, will be shown. The structural and chemical analysis of these compounds emphasizes the importance of strong interlayer coupling in enhancing Tc in Fe based superconductors.

Colloquium

All interested persons are cordially invited to attend.