

The Iron Age of High T_c Superconductivity

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Back in 2008 a new class of high temperature superconductors containing FeAs or FeSe layers were discovered which attracted a lot of attention. While there is broad consensus that superconductivity in these “Fe-based superconductors” is due to an unconventional, most likely electronic pairing, many important aspects of the normal and superconducting state are still unexplored. In particular, the role of orbital degrees of freedom for the normal state electronic properties, nematicity, and pairing is discussed very controversial. In my talk I will discuss the electronic structure highlighting the role of electronic correlations in Fe-based superconductors. The characteristic so-called nematic instability of these systems will be introduced and I will present results on a series of large high quality La-1111 single crystals which have been grown for the first time using a method based on anomalous solid state reaction. We have reexamined the phase diagram and studied magnetism and nematic order by means of NMR and strain dependent transport measurements. The obtained phase diagram point to an intimate connection between superconductivity and nematic fluctuations highlighting a crucial role of orbital degrees of freedom in Fe based