Electronic structure of iron-based superconductors

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Iron based superconductors have ignited another round of intensive research on high temperature superconductivity. The electronic structure measured by angle resolved photoemission spectroscopy provides crucial information on the microscopic nature of this new class of superconductors.

In this talk I will discuss some of our recent works in this area.

(1) Multiple orbitals are considered a key feature of this new class of superconductors. With polarization-dependent photoemission and matrix element analysis, we were able to identify the orbital nature of various bands in the superconducting $BaFe_{2-x}Co_xAs_2$ and $FeTe_xSe_{1-x}$ systems. Our results are rather different from the LDA calculations, indicative strong correlation effects.

(2) Anomalous band splittings in the spin density wave (SDW) state of the parent compounds have been observed, which leads to a novel SDW mechanism that does not require Fermi surface nesting in these materials.

(3) The isotropic superconducting gap around individual Fermi surfaces of $Ba_{1-x}K_xFe_2As_2$ has been examined with various photon energies that sample different k_z's.

[1] L. X. Yang et al. Phys. Rev. Lett. **102**, 107002 (2009).
[2] Y. Zhang et al. Phys. Rev. Lett. **102**, 127003 (2009).
[3] Y. Zhang et al. arXiv: cond-mat/0904.4022 (2009)