MAR12-2011-002481

Abstract for an Invited Paper
for the MAR12 Meeting of
the American Physical Society

Distinct Fermi Surface Topology in $A_xFe_{2-y}Se_2$ Revealed by ARPES

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The discovery of superconductivity with a transition temperature above 30 K in $A_xFe_{2-y}Se_2$ (A=alkali metal or Thallium) triggered a new wave of research on the iron-based superconductors. The new $A_xFe_{2-y}Se_2$ superconductor exhibits many unique characteristics which make it a new platform to uncover the pairing mechanism of the iron-based superconductors. In this talk, we will show the electronic structures of $A_xFe_{2-y}Se_2$ by means of ARPES, including Fermi Surface topology, superconducting gap structure and electron dynamics. The observed Fermi surface topology with only electron-like pockets is distinct from other iron-based superconductors and challenges the pairing mechanism based on scattering between electron-like and hole-like Fermi surface sheets. Nearly isotropic superconducting gap without nodes is revealed for all Fermi surface sheets which favors s-wave pairing symmetry. Other related topics, such as Fe vacancy order and phase separation, will also be discussed from viewpoint of our ARPES results.

[1] D. Mou, S. Liu, J. He, et. al, Phys. Rev. Lett. 106, 107001 (2011).
[2] L. Zhao, D. Mou, S. Liu, et al., Phys. Rev. B 83, 140508(R) (2011).