Hidden Symmetry Breaking and High Temperature Superconductivity Pairing at 83K in FeSe-Based Superconductors

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We will report our recent angle-resolved photoemission (ARPES) studies on iron-based superconductors [1-3]. We observed highly anisotropic Fermi surface and extremely anisotropic superconducting gap in the nematic state of the FeSe superconductor [1]. We identified two hole-like Fermi surface sheets around the Brillouin zone center, and the splitting of the associated bands, in the nematic state of FeSe [2]. These indicate that, in addition to nematic order and spin-orbit coupling, there is an additional order in FeSe that breaks either inversion or time-reversal symmetries. Finally, we present spectroscopic evidence of superconductivity pairing at 83 K in single-layer FeSe/$SrTiO_3$ films [3]. We find that the superconductivity pairing state can be divided into two temperature regions of 64-83 K and below 64 K. These results indicate that either Tc as high as 83 K is achievable in iron-based superconductors, or there is a pseudogap formation from superconductivity fluctuation in single-layer FeSe/$SrTiO_3$ films.

References

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