Three-dimensional Fermi-surface mapping of $BaFe_2As_2$ using low-energy angle-resolved photoemission spectroscopy

Recently the occurrence of high-Tc superconductivity in iron-based layered materials has been reported. However, the three-dimensional shape of Fermi surface remains controversial. In this work, we have studied BaFe2As2 by high-resolution angle-resolved photoemission spectroscopy (ARPES) using low-energy tunable photons and linearly-polarized photons, and determined the band dispersion in three-dimensional momentum space. The experiments were performed at BL-9A and BL-1 of Hiroshima Synchrotron Radiation Center. Along the Γ-X cut parallel to *kx* axis, two hole-like bands, α and β, and an electron-like band, ε', are observed around Γ point near the Fermi level. Scanning the photon energy *hv* from 6.5 to 30 eV, we mapped out Fermi-surface cross section in *kx* - *kz* plane, and observed fine warping structures along *kz* dispersion. The Fermi surfaces, β and ε', are proximate to each other in large *kz* range, indicating Fermi-surface nesting between them. The Fermi surface, α, has an egg-like shape separated at Γ and Z points with strong *kz*-warping. Our results suggest that the Fermi surfaces of BaFe2As2 are largely reconstructed due to collinear antiferromagnetic order.