Fermi states in the decagonal Al-Ni-Co quasicrystal: Dual energy scale of the structure stabilization

V.A. Rogalev

Swiss Light Source, Paul Scherrer Institute, CH-5232 Villigen, Switzerland

Quasicrystals (QCs) are intermetallic alloys which have excellent long-range order but lack of translational symmetry in at least one dimension [1]**. The valence band electronic structure near the Fermi energy E_F in such materials is of special interest since it has a direct relation to their main unusual physical properties** [2]**. However, the Fermi surface (FS) topology as well as the mechanism of QC structure stabilization is still under debate. The widely reported pseudogap in the density of states near E_F** [3–5] **is believed to appear due to destructive interference of FS states at the boundaries of quasi-Brillouin zone stabilizing the QC structure (Hume-Rothery stabilization mechanism). Using Soft X-Ray Angle Resolved Photoemission Spectroscopy (SX-ARPES) we were able to observe the three dimensional FS and valence band dispersions in decagonal $Al_{77}Ni_{17}Co_6$ (d-AlNiCo)[6]. In my talk I will discuss the topology of the observed FS and it characteristic features.**

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