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Suppression of Itinerant p-Wave Exchange Splitting by Localized 4f Electrons in CeNiAsO

Jiuxiang ZHANG

National Lab for Superconductivity, Institute of Physics, Chinese Academy of Sciences, P.R. China

Email: jiuxiang.zhang@iphy.ac.cn

Altermagnetism enables momentum-dependent spin splitting in compensated magnets without net magnetization, but how this band-splitting signature manifests in strongly correlated f-electron systems remains an open question. CeNiAsO, a Ce-based Kondo-lattice antiferromagnet, has been proposed as a candidate metallic p-wave altermagnet, providing a platform to examine the interplay between altermagnetic symmetry, itinerant band structure, and localized 4f correlations.

Here we combine high-resolution angle-resolved photoemission spectroscopy, resonant photoemission, and correlation-dependent first-principles calculations to investigate the low-energy electronic structure of CeNiAsO. Fermi-surface mapping and orbital-resolved ARPES show that the experimentally observed itinerant bands near the Fermi level are predominantly Ni 3d-derived. Resonant photoemission, meanwhile, reveals mainly localized Ce 4f states with residual c-f hybridization. Correlation-dependent calculations further show that treating the Ce 4f electrons as localized shifts the 4f spectral weight away from the Fermi level and reduces the splitting of the Ni 3d-derived bands to the few-meV scale.

Guided by this localized-4f calculated electronic structure, low-temperature ARPES measurements across the magnetic transitions reveal no resolvable p-wave-like exchange splitting of the Ni 3d-derived conduction bands. These results show that localized Ce 4f electrons strongly suppress the observable itinerant band-splitting signature predicted for CeNiAsO in a weak-correlation p-wave altermagnetic picture.