

Theory of superconducting parity transition: CeRh₂As₂ and beyond

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Exploring internal degrees of freedom is a fundamental and traditional approach to searching for novel quantum phases and phenomena. In this talk, I will discuss multiple superconducting phases and related phenomena observed in the heavy fermion compound CeRh₂As₂ [1] based on the theory of parity transition in superconductors with a sublattice degree of freedom [2].

Multicomponent superconductors exhibit exotic pairing symmetry and topological superconductivity. Topological odd-parity superconductivity is proposed through a combination of density functional theory and ARPES experiment [3,4]. I will also present a vortex phase diagram indicating a fractional vortex phase that is identified as a topological meron state [5]. Based on the peculiar band structure predicted by first-principles calculations, we construct a periodic Dirac-Anderson model to demonstrate an interplay between quantum geometry and electron correlation [6].

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