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Exotic pairing in multiband superconductors

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In the standard BCS theory of superconductivity, the Cooper pairs are formed by electrons from the same band. However, pairing of electrons from different bands may play an important role in many superconducting materials of current interest. Including interband pairing alongside the usual intraband one leads to qualitative changes in the nodal structure: energy gap nodes can (dis)appear, merge, and leave high-symmetry locations in the Brillouin zone. The Andreev boundary modes change qualitatively with increasing the interband pairing, e.g., flat zero-energy boundary states characteristic of a d-wave pairing gap out and transition to helical edge states. Depending on the symmetries of the bands involved in the Cooper pairing, some unusual gap features become possible, such as odd-parity singlet and even-parity triplet gaps. Also, a variety of time-reversal symmetry breaking superconducting states are stabilized by interband pairing.

Keyword-1

Superconductivity

Keyword-2

Multiband pairing

Keyword-3

TRS breaking

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