

Non-centrosymmetric Superconductivity Cooper pairs deprived of a key symmetry

Manfred Sigrist

Theoretische Physik, ETH Zürich, 8093 Zürich, Switzerland

The unusual properties found in the recently discovered heavy Fermion superconductor CePt₃Si have motivated numerous experimental and theoretical studies. The distinguishing feature compared to many other superconducting materials is the absence of an inversion center in the crystal lattice. Interestingly, this has a profound influence on superconductivity, since, together with time reversal, inversion is a key symmetry for Cooper pair formation. In CePt₃Si and related non-centrosymmetric materials Cooper pairs form with mixed even- and odd-parity, and in this way belonging to the class of non-unitary superconducting phases, with the only other known example found in superfluid ³He. The unusual properties have their microscopic origin in the special form of spin-orbit coupling occurring in crystals without inversion symmetry. The consequences are most strikingly seen in high magnetic fields, and also in the low-temperature properties which are governed by the anisotropic quasiparticle gap structure of the superconducting phase. Several novel phenomena are anticipated on theoretical level and wait for experimental verification. This presentation will give an overview on the present understanding and experimental status of non-centrosymmetric superconductivity.