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Abstract

Superconductivity – materials and mechanisms

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In this overview lecture, the various classes of superconductors will be introduced : (1) conventional ones with gap functions of the same symmetry as the crystal which we understand in detail based on the phonon-mediated BCS pairing theory and its various extensions, including multi-band-multi-gap superconductivity found in recent examples, such as MgB_2 . (2) Unconventional superconductors *("phase diagram superconductors" PDS)* where the superconducting ground state occurs in close proximity to other broken symmetry ground states, incl. magnetism or other superconducting ground states, when an external parameter is varied, such as pressure or chemical composition . Outstanding examples include, e.g., the layered cuprates, heavy fermion compounds, organic metals, cobaltates and ruthenates, and the currently widely investigated Fe-based pnictides and chalcogenides.