Interplay of anisotropic superconductivity and magnetism in iron-based compounds

R. Puzniak[1]

[1] *Institute of Physics, Polish Academy of Sciences, Aleja Lotnikow 32/46, 02-668 Warszawa, Poland*

Experimentally deduced magnetic and superconducting anisotropy of various iron-based compounds is discussed. The anisotropy parameter of the superconducting state for both, iron-pnictides and iron-chalcogenides, varies for various families and strongly depends on thermodynamic parameters such as temperature and magnetic field. Interestingly, the upper critical field anisotropy is found to be much smaller than the magnetic penetration depth anisotropy, pointing towards multi-gap superconductivity. In agreement, the in-plane magnetic penetration depth, related to the superconducting carrier density, increases with increasing magnetic field due to a partial suppression of the energy gap. Besides superconductivity, various iron-based compounds exhibit coexisting magnetic order. This order can be influenced by an external magnetic field, making iron-based superconductors a fascinating template for magnetic-field tuned applications.

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