

Investigation of CeRh_2As_2 order parameters via ultrasound propagation

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Unconventional superconductors with nearly degenerate pairing states are rare. CeRh_2As_2 has recently emerged as one of the few known multi-phase superconductors (SC) [1]. It exhibits a first-order phase transition between two distinct SC states in magnetic fields. While this behavior has been linked to locally broken inversion symmetry, a phase diagram based on a multicomponent SC order parameter (OP) remains a possibility. Furthermore, SC appears to coexist with an ordered state (phase I) [2]. Despite extensive studies, the nature of the OP in both SC phases and in phase I remains unresolved. Here we use ultrasound-propagation measurements, a probe sensitive to OP symmetry, at low temperatures, in high magnetic fields, and under hydrostatic pressure to address this issue. Our results strongly suggest that the SC OP in both phases is single component, thereby experimentally establishing local non-centrosymmetry as the mechanism leading to multi-phase superconductivity in CeRh_2As_2 . In addition, analysis of the elastic anomalies within a symmetry-based Landau framework indicates the presence of an incommensurate magnetic OP in phase I [3].

References

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