Evidence of P-wave Pairing in $K_2Cr_3As_3$ Superconductors from Phase-Sensitive Measurement

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Abstract

P-wave superconductors hold immense promise for both fundamental physics and practical applications due to their unusual pairing symmetry and potential topological Superconductivity [1]. However, the exploration of the p-wave superconductors has proved to be a complex endeavor. Not only are they rare in nature but also the identification of p-wave superconductors has been an arduous task in history. For example, phase-sensitive measurement, an experimental technique which can provide conclusive evidence for unconventional pairing [2], has not been implemented successfully to identify p-wave superconductors [3]. Here, we study a recently discovered family of superconductors, $A_2Cr_3As_3$ (A = K, Rb, Cs), which were proposed to be promising candidates for p-wave superconductors [4-6]. We fabricate superconducting quantum interference devices (SQUIDs) on exfoliated $K_2Cr_3As_3$ (Figure 1), and perform the phase-sensitive measurement. It reveals the admixture of 0- and π-phase in these SQUIDs (Figure 2), and we conclude that the existence of the π-phase is in favor of the p-wave pairing symmetry in $K_2Cr_3As_3$.

References

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Figures

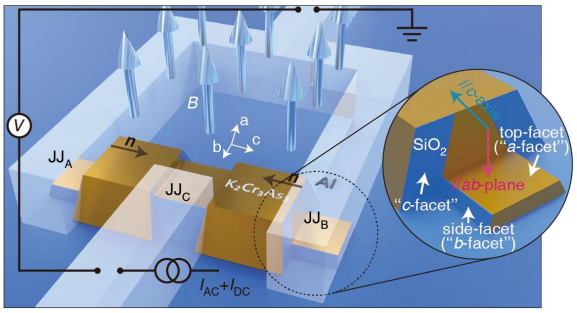

Figure 1: P-wave phase-sensitive measurement of $K_2Cr_3As_3$ superconductor using Al-$K_2Cr_3As_3$ SQUID

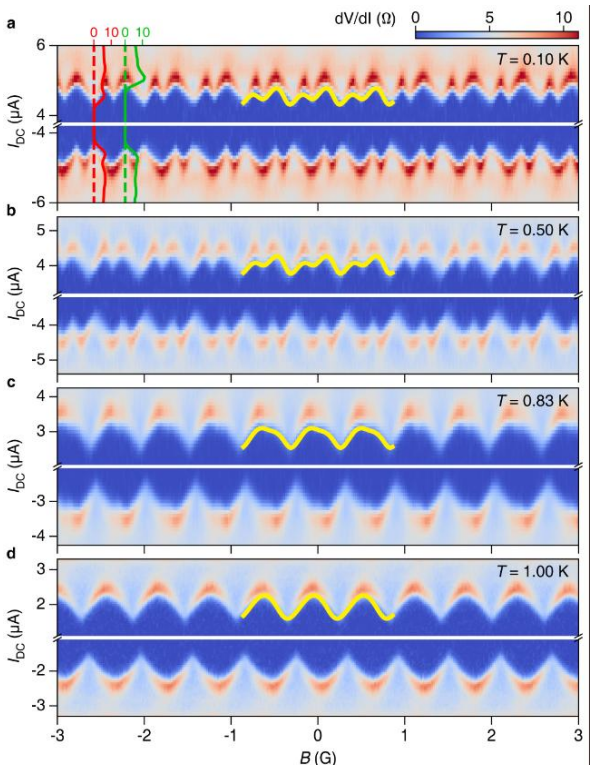

Figure 2: π-phase supercurrent component appears at low temperatures, causing the quasi-Φ_0/2-periodic I_C oscillations (**a, b**) in SQUID measurement. At high temperatures (**c, d**) conventional Φ_0-periodic oscillations from 0-phase supercurrent is recovered.